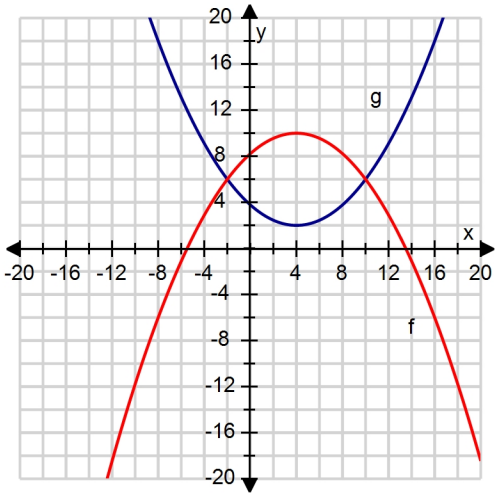
# *Biocalculus - Calculus Probability and Statistics for the Life Sciences 2nd edition Stewart Test Bank*

SKU: 9798214002576-TEST-BANK

## 1.1 Four Ways to Represent a Function

1. The graphs of $f(x)$ and $g(x)$ are given. For what values of $x$ is $f(x) = g(x)$?




a. 2, 3

b. 0

c. –1

d. –2, 5

e. –2, 10

| | |
|---|---|
| *ANSWER:* | e |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.4b SCalc7e 1.1.4b |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.12 - Express a function numerically, given its verbal, algebraic,or graphical representation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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## 1.1 Four Ways to Represent a Function

2. Which of the following functions is neither even nor odd?

a. $f(x) = \dfrac{2x^2}{x^4 + 1}$

b. $f(x) = 8x^3 + 10x^2 + 7$

c. $f(x) = x^3 - 3x$

| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.78 SCalc7e 1.1.78 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.04.03 - Determine if a function is odd or even algebraically. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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3. If the point $(9, 7)$ is on the graph of an even function, what other point must also be on the graph?

a. $(-9, -7)$

b. $(9, -7)$

c. $(0, 0)$

d. $(-9, 7)$

e. None of these

| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.71a SCalc7e 1.1.71a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.04.05 - Describe the symmetry present in the graph of an even function. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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4. If $f(x) = x^2 - x + 8$, evaluate the difference quotient $\dfrac{f(a+h) - f(a)}{h}$.

a. $2a + h - 8$

b. $2a - 8$

c. $2a - h - 8$

d. $h$

e. none of these

| | |
|---|---|
| *ANSWER:* | e |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.28 SCalc7e 1.1.28 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.08 - Evaluate functions for given values of the independent variable. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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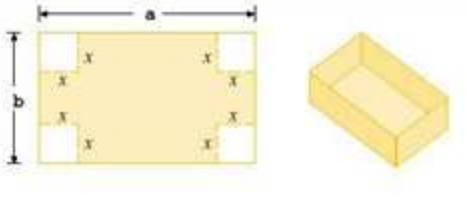


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## 1.1 Four Ways to Represent a Function

5. A box with an open top is to be constructed from a rectangular piece of card board with dimensions $b = 6$ in. by $a = 25$ in. by cutting out equal squares of side $x$ at each corner and then folding up the sides as in the figure.

   Express the volume $V$ of the box as a function of $x$.




a. $V(x) = x^3 - 62x^2 + 150x$

b. $V(x) = 4x^3 + 31x^2 + 196x$

c. $V(x) = 4x^3 + 62x^2 + 150x$

d. $V(x) = x^3 - 31x^2 + 196x$

e. $V(x) = 4x^3 - 62x^2 + 150x$

| | |
|---|---|
| *ANSWER:* | e |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.63 SCalc7e 1.1.63 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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6. Find an expression for the function $y = f(x)$ whose graph is the bottom half of the parabola $x + (10 - y)^2 = 0$.

a. $y = 10 - \sqrt{-x}$

b. $y = 100 - \sqrt{-x}$

c. $y = 10 + \sqrt{x}$

d. $y = 100 - x^2$

e. $y = 10 - x^2$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.53 SCalc7e 1.1.53 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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7. A rectangle has perimeter 14 m. Express the area of the rectangle as a function $A(l)$ of the length $l$ of one of its sides.

a. $A(l) = 7l - l^2$

b. $A(l) = l - 7l^2$

c. $A(l) = 14l - l^2$

d. $A(l) = 14l + l^2$

e. $A(l) = 7l + l^2$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.57 SCalc7e 1.1.57 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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8. If $f(x) = 5x^2 + 2$, find and simplify $\dfrac{f(1+h) - f(1)}{h}$, where $h \neq 0$.

a. $2 + 5h^2$

b. $5 + 10h$

c. $5h$

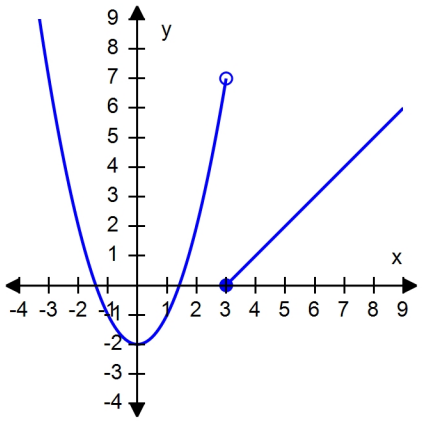
d. $10 + 5h$

| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | SCalcET7 1.1.27 SCalc7e 1.1.27 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.08 - Evaluate functions for given values of the independent variable. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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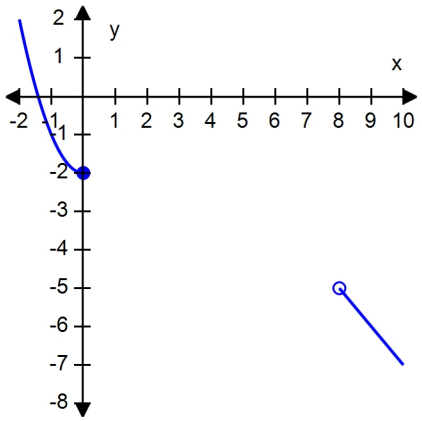
9. Find the domain and sketch the graph of the function. What is its range?

$$f(x) = \begin{cases} -x + 3 & \text{if } x \geq 3 \\ x^2 - 2 & \text{if } x < 3 \end{cases}$$

a. ***D***: $(-\infty, \infty)$; ***R***: $[-2, \infty)$




b. ***D***: $(-\infty, \infty)$; ***R***: $(-\infty, 0]$



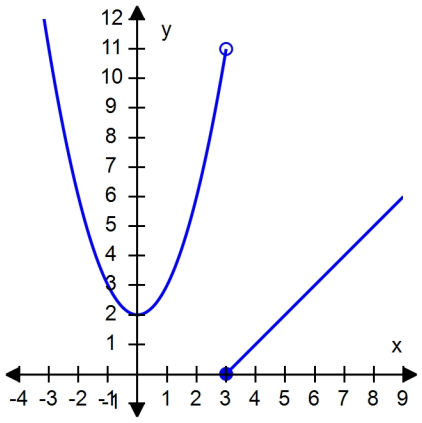

c. ***D***: $(-\infty, \infty)$; ***R***: $[0, \infty)$

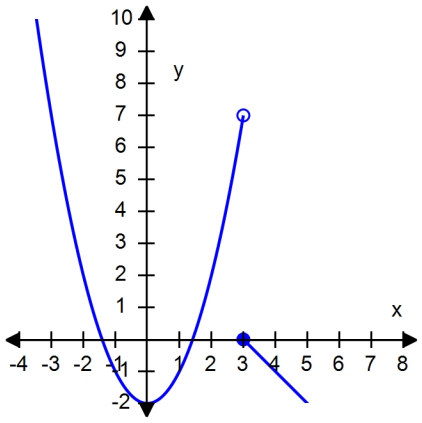
d. ***D***: $(-\infty, \infty)$; ***R***: $(-\infty, \infty)$

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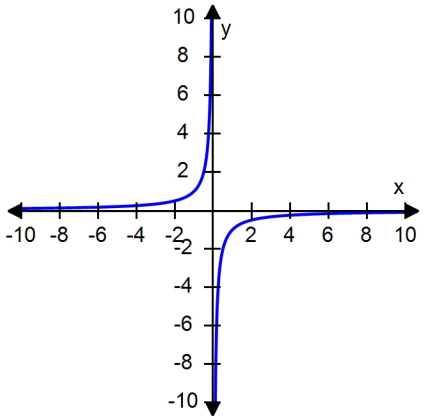

| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.49 SCalc7e 1.1.49 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.03 - Define range of a function. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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10. Determine whether the function whose graph is given is even, odd, or neither.




a. Even

b. Neither

c. Odd

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.69 SCalc7e 1.1.69 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.04.04 - Determine if a function is odd or even graphically. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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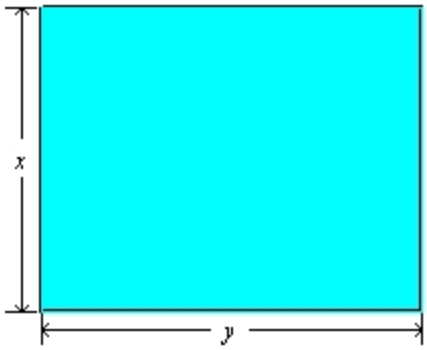
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## 1.1 Four Ways to Represent a Function

11. Sandy wishes to have a rectangular garden in her backyard. She has 50 ft of fencing with which to enclose her garden. Letting $x$ denote the width of the garden, find a function $f$ in the variable $x$ that gives the area of the garden.




a. $f(x) = 50x - x^2, 0 < x < 25$

b. $f(x) = 25x - x^2, 0 < x < 25$

c. $f(x) = 50x - x^2, 0 < x < 50$

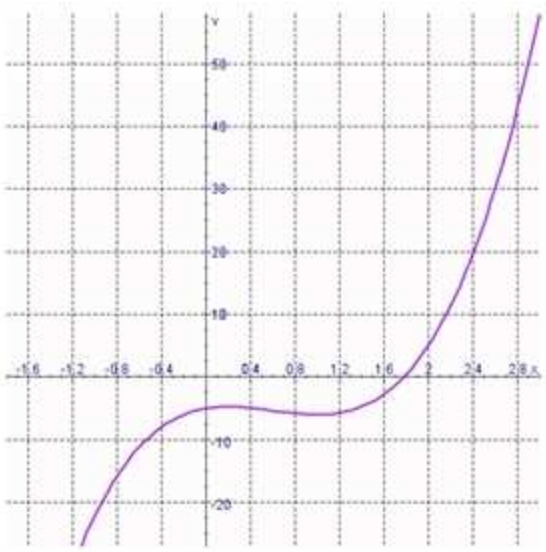
d. $f(x) = 25x - x^2, 0 < x < 50$

| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.62 SCalc7e 1.1.62 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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12. The graph of the function $f$ is given. State the value of $f(2.7)$.



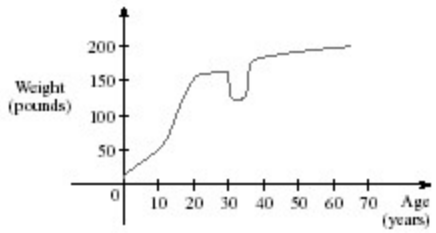
a. $f(2.7) = -40$
b. $f(2.7) = -10$
c. $f(2.7) = 40$
d. $f(2.7) = 0$
e. $f(2.7) = 10$

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.3b SCalc7e 1.1.3b |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.02.03 - Identify the value of a function from its graph. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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13. The graph shown gives the weight of a certain person as a function of age. Find the age at which the person stopped an exercise program.




a. 20

b. 54

c. 38

d. 35

e. 70

| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.11 SCalc7e 1.1.11 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.12 - Express a function numerically, given its verbal, algebraic,or graphical representation. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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## 1.1 Four Ways to Represent a Function

14. In the function $f(x) = 8x + d$, what must be the value $d$, if $f(3) = 1$?

a. $d = 25$
b. $d = 23$
c. $d = -23$
d. $d = -1$
e. $d = -25$

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.25 SCalc7e 1.1.25 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.08 - Evaluate functions for given values of the independent variable. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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15. An open rectangular box with volume 4 $m^3$ has a square base. Express the surface area of the box as a function $S(x)$ of the length $x$ of a side of the base.

a. $S(x) = x^2 + \frac{16}{x^2}$

b. $S(x) = x^2 + \frac{16}{x}$

c. $S(x) = 2x^2 + \frac{6}{x^2}$

d. $S(x) = x^2 + \frac{6}{x^2}$

e. $S(x) = 2x + \frac{6}{x}$

| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.61 SCalc7e 1.1.61 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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16. Determine whether $f$ is even, odd, or neither.

$$f(x) = \frac{8x^2}{x^4 + 5}$$

a. neither

b. odd

c. even

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.74 SCalc7e 1.1.74 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.04.03 - Determine if a function is odd or even algebraically. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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17. Determine whether $f$ is even, odd, or neither.

$$f(x) = \frac{2x^2}{x^4 + 1}$$

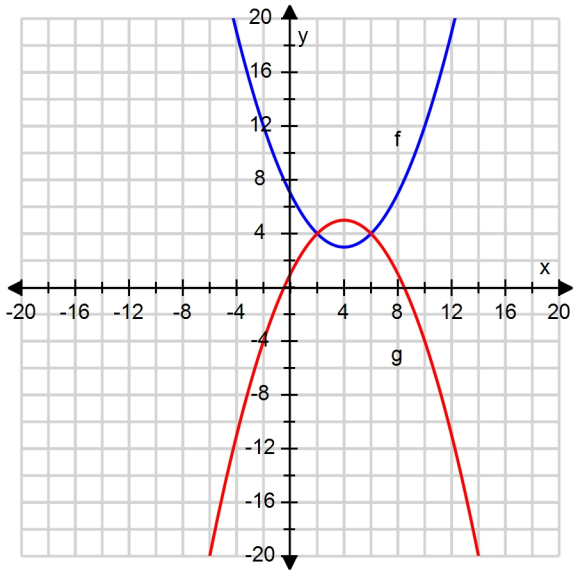
| | |
|---|---|
| *ANSWER:* | even |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.74 SCalc7e 1.1.74 |
| *QUESTION TYPE:* | Numeric Response |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.04.03 - Determine if a function is odd or even algebraically. |
| *OTHER:* | Numerical Response |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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18. The graphs of $f(x)$ and $g(x)$ are given.
    a) For what values of $x$ is $f(x) = g(x)$?
    b) Find the values of $f(-1)$ and $g(12)$.




*ANSWER:* a) 2, 6 b) $f(-1) = 12, g(12) = -10$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* SCalcET7 1.1.4ab SCalc7e 1.1.4ab
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.02.03 - Identify the value of a function from its graph.
*OTHER:* Numerical Response
*NOTES:* SCalcET7 Section 1.1 SCalc7e Section 1.1
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19. A spherical balloon with radius $r$ inches has volume $\frac{4}{3}\pi r^3$.

Find a function that represents the amount of air required to inflate the balloon from a radius of $r$ inches to a radius of $r + 7$ inches.

*ANSWER:* $\frac{28}{3}\pi(3r^2 + 21r + 49)$

| | |
|---|---|
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.26 SCalc7e 1.1.26 |
| *QUESTION TYPE:* | Numeric Response |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation. |
| *OTHER:* | Numerical Response |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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20. If $f(x) = \begin{cases} x^2 + 7 & \text{if } x \le 0 \\ \sqrt{x} & \text{if } x > 0 \end{cases}$

find $f(-3)$, $f(0)$, and $f(4)$.

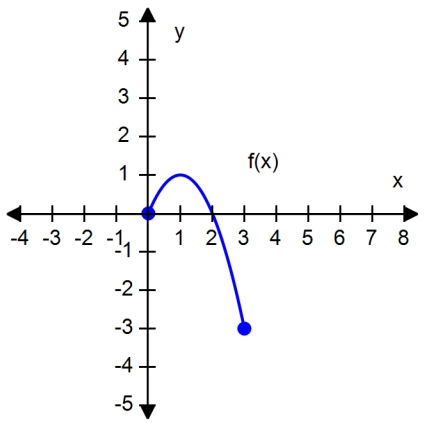
| | |
|---|---|
| *ANSWER:* | $f(-3) = 16,\ f(0) = 7,\ f(4) = 2.$ |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | SCalcET7 1.1.25 SCalc7e 1.1.25 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.08 - Evaluate functions for given values of the independent variable. |
| *OTHER:* | Short Answer |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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21. Refer to the graph of the function $f$ in the following figure.




**a.** Find $f(0)$.
**b.** Find the value of $x$ for which (i) $f(x) = 1$ and (ii) $f(x) = 0$.
**c.** Find the domain and range of $f$.

| | |
|---|---|
| *ANSWER:* | **a.** 0<br>**b.** (**i**) 1 (**ii**) 0, 2<br>**c.** ***D***: [0, 3], ***R***: [–3, 1] |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | SCalcET7 1.1.3ace SCalc7e 1.1.3ace |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.03 - Define range of a function. |
| *OTHER:* | Short Answer |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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22. Determine whether the function is even, odd, or neither.

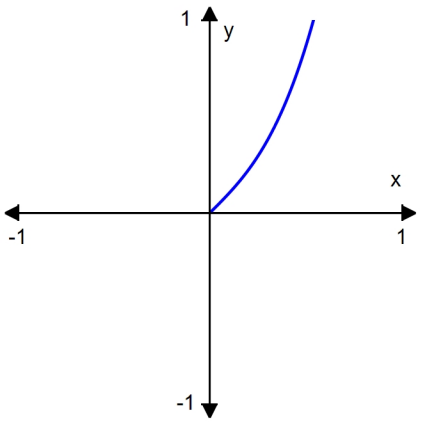
$f(x) = 4x^2 + 8x + 1$

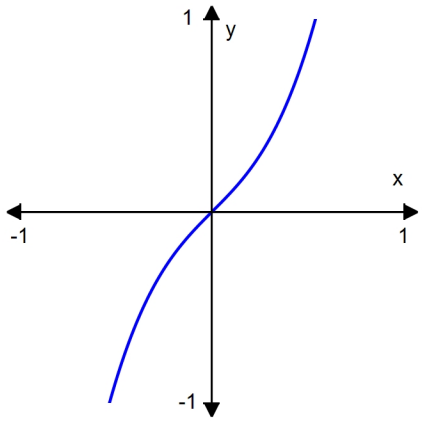
| | |
|---|---|
| *ANSWER:* | Neither |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.77 SCalc7e 1.1.77 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.04.03 - Determine if a function is odd or even algebraically. |
| *OTHER:* | Short Answer |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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23. The following figure shows a portion of the graph of a function $f$ defined on the interval $[-1, 1]$. Sketch the complete graph of $f$ if it is known $f$ is odd.



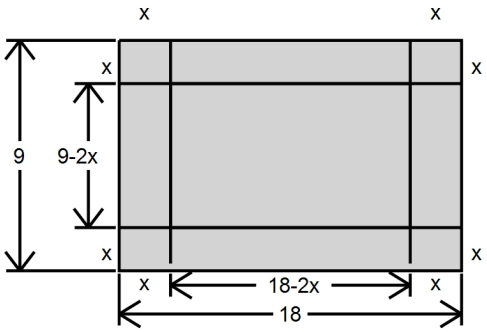

*ANSWER:*

| | |
|---|---|
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.72b SCalc7e 1.1.72b |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.04.09 - Sketch graphs of functions that are symmetric with respect to the x-axis, y-axis, or the origin. |
| *OTHER:* | Short Answer |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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24. By cutting away identical squares from each corner of a rectangular piece of cardboard and folding up the resulting flaps, an open box can be made. If the cardboard is 18 in. long and 9 in. wide and the square cutaways have dimensions of $x$ in. by $x$ in., find a function that gives the volume of the resulting box.



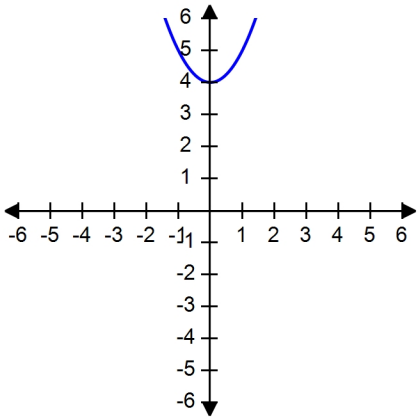

*ANSWER:* $V = 4x^3 - 54x^2 + 162x$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* SCalcET7 1.1.63 SCalc7e 1.1.63
*QUESTION TYPE:* Subjective Short Answer
*HAS VARIABLES:* True
*STUDENT ENTRY MODE:* Basic
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation.
*OTHER:* Short Answer
*NOTES:* SCalcET7 Section 1.1 SCalc7e Section 1.1
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25. Use the vertical line test to determine whether the curve is the graph of a function of $x$.



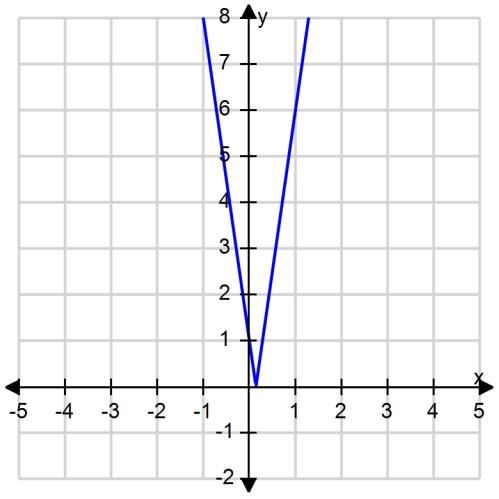

| | |
|---|---|
| *ANSWER:* | Yes |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.7 SCalc7e 1.1.7 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.06 - Given its graph, determine if a relation is a function using the vertical line test. |
| *OTHER:* | Short Answer |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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26. Sketch the graph of the function.

$f(x) = |1 - 7x|$



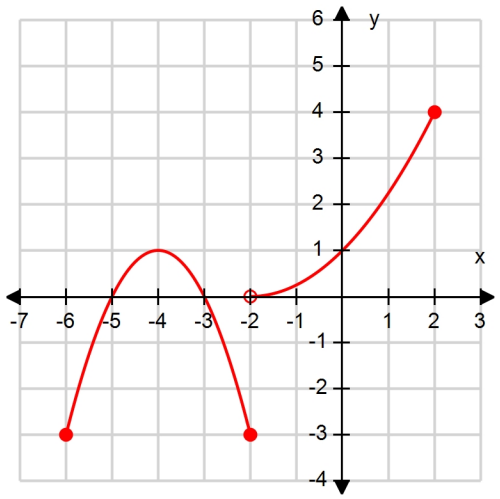

*ANSWER:*

| | |
|---|---|
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.13 - Express a function graphically, given its verbal or numerical representation. |
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27. The graph of a function $g$ is given. On what interval(s) is $g$ increasing?




*ANSWER:* $[-6, -4] \cup (-2, 2]$

*POINTS:* 1
*QUESTION TYPE:* Subjective Short Answer
*HAS VARIABLES:* True
*STUDENT ENTRY MODE:* Basic
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.02.07 - Find the intervals where a function is increasing and decreasing using its graph.
*DATE CREATED:* 1/21/2021 7:58 AM
*DATE MODIFIED:* 2/5/2021 9:36 AM

28. Determine whether the statement is true or false.

If $x_1 > x_2$ and $f$ is a decreasing function, then $f(x_1) > f(x_2)$.

a. True

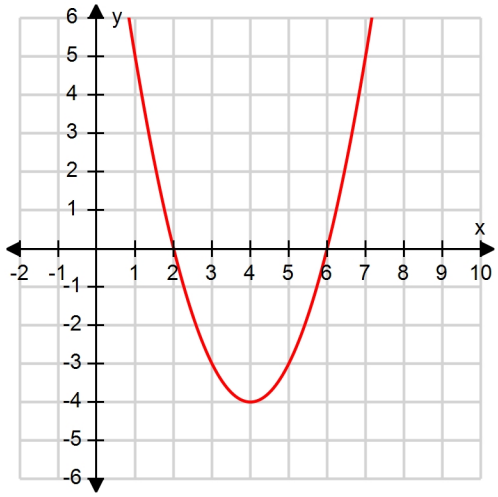
b. False

*ANSWER:* False
*POINTS:* 1
*QUESTION TYPE:* True / False
*HAS VARIABLES:* False
*LEARNING OBJECTIVES:* PCALC.COH.UO.01.02.02 - Examine the characteristics of functions and their graphs.
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29. Let $f$ be the function whose graph is given. Find the interval where the function is decreasing.




a. $(-\infty, 4)$

b. $(4, \infty)$

c. $[2, 6]$

d. $(-4, \infty)$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.02.07 - Find the intervals where a function is increasing and decreasing using its graph. |
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**1.2 A Catalog of Essential Functions**

1. Many physical quantities are connected by *inverse square laws*, that is, by power functions of the form:
$$f(x) = kx^{-2}$$

In particular, the illumination of an object by a light source is inversely proportional to the square of the distance from the source. Suppose that after dark you are in a room with just one lamp and you are trying to read a book. The light is too dim and so you move $\frac{2}{3}$ds the distance to the lamp. How much brighter is the light?

a. $\frac{3}{2}$ times

b. $\frac{9}{4}$times

c. $\frac{9}{2}$ times

d. $\frac{4}{9}$ times

e. 3 times

| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.2.25 SCalc7e 1.2.25 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.08 - Evaluate functions for given values of the independent variable. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.2 SCalc7e Section 1.2 |
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2. Scientists have discovered that a linear relationship exists between the amount of flobberworm mucus secretions and the air temperature. When the temperature is 45°F, the flobberworms each secrete 8.5 grams of mucus a day; when the temperature is 75°F, they each secrete 11.5 grams of mucus a day. Find a function $M(t)$ that gives the amount of mucus secreted on a given day, where $t$ is the temperature of that day in degrees Fahrenheit.

a. $M(t) = 0.1t + 8.5$
b. $M(t) = 10t + 8.5$
c. $M(t) = 10t + 4$
d. $M(t) = 0.1t + 4$

| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.2.15a SCalc7e 1.2.15a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.2 SCalc7e Section 1.2 |
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3. The relationship between the Fahrenheit and Celsius temperature scales is given by the linear function.

$$F = \frac{9}{5}C + 32$$

What is the $F$-intercept and what does it represent?

a. $\frac{9}{5}$, Fahrenheit temperature corresponding to $0^\circ$C

b. $\frac{9}{5}$, Celsius temperature corresponding to $32^\circ$C

c. 32, Celsius temperature corresponding to $0^\circ$F

d. 0, Fahrenheit temperature corresponding to $32^\circ$C

e. 32, Fahrenheit temperature corresponding to $0^\circ$C

| | |
|---|---|
| *ANSWER:* | e |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.2.13a SCalc7e 1.2.13a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | False |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.02.01.06 - Find the zeros of a polynomial function algebraically. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.2 SCalc7e Section 1.2 |
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4. The monthly cost of driving a car depends on the number of miles driven. Julia found that in October it cost her \$300 to drive 400 mi and in July it cost her \$450 to drive 700 mi. Express the monthly cost $C$ as a function of the distance driven $d$ assuming that a linear relationship gives a suitable model.

   a. $C = -100d + 0.5$
   b. $C = 100d - 0.5$
   c. $C = 0.5d + 100$
   d. $C = 2d + 100$
   e. $C = 0.5d - 100$

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.2.18 SCalc7e 1.2.18 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.2 SCalc7e Section 1.2 |
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5. Classify the function as a Polynomial function, a Rational function, an algebraic function, or other.

$f(x) = x^9 + 4x^6 - 6$

a. Other
b. Algebraic
c. Polynomial
d. Rational

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | SCalcET7 1.2.1 SCalc7e 1.2.1 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.02.01.01 - Define polynomial function. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.2 SCalc7e Section 1.2 |
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6. It makes sense that the larger the area of a region, the larger the number of species that inhabit the region. Many ecologists have modeled the species-area relation with a power function and, in particular, the number of species $S$ of bats living in caves in central Mexico has been related to the surface area $A$ measured in $m^2$ of the caves by the equation

$S = 0.7A^{0.3}$

(a) The cave called mission impossible near puebla, mexico, has suface area of $A = 50m^2$.

How many species of bats would expect to find in that cave?

(b) If you discover that 3 species of bats live in cave estimate the area of the cave.

| | |
|---|---|
| *ANSWER:* | a) 2 species<br>b) 128 $m^2$ |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.2.26 SCalc7e 1.2.26 |
| *QUESTION TYPE:* | Numeric Response |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.08 - Evaluate functions for given values of the independent variable. |
| *OTHER:* | Numerical Response |
| *NOTES:* | SCalcET7 Section 1.2 SCalc7e Section 1.2 |
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7. The relationship between the Fahrenheit and Celsius temperature scales is given by the linear function.

$$F = \frac{9}{5}C + 32$$

Complete the table and find the slope. Round your answers to the nearest whole number.

| °C | °F |
|---|---|
| 15 | |
| –15 | |
| **slope** | |

*ANSWER:* (15, 59), (–15, 5); slope = 2

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* SCalcET7 1.2.13b SCalc7e 1.2.13b
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.02.11 - Solve applied problems involving rates of change.
*OTHER:* Numerical Response
*NOTES:* SCalcET7 Section 1.2 SCalc7e Section 1.2
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8. Find the domain of the function

$$f(x) = \frac{1}{\sqrt{3} - 2\cos x}$$

a. $x \neq \frac{\pi}{6} + 2\pi n$ and $x \neq \frac{11\pi}{6} + 2\pi n$, where $n$ is any integer

b. $x \neq \frac{11\pi}{6}$ and $x \neq \frac{11\pi}{6}$

c. $x \neq \frac{5\pi}{6} + 2\pi n$ and $x \neq \frac{7\pi}{6} + 2\pi n$, where $n$ is any integer

d. $x \neq \frac{5\pi}{6}$ and $x \neq \frac{7\pi}{6}$

e. $x \neq \frac{\pi}{4} + 2\pi n$ and $x \neq \frac{7\pi}{4} + 2\pi n$, where $n$ is any integer

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.02 - Define domain of a function. |
| *DATE CREATED:* | 3/22/2016 9:17 AM |
| *DATE MODIFIED:* | 2/5/2021 9:41 AM |

9. If the recommended adult dosage for a drug is $D$ (in mg), then to determine the appropriate dosage $c$ for a child of age $a$, pharmacists use the equation $c = 0.04D(a + 1)$. Suppose the dosage for an adult is 900 mg. What is the slope of the graph of $c$ and what does it represent?

a. 36 mg/yr; the rate of change of dosage with respect to age

b. 36 yr/mg; the rate of change of age with respect to dosage

c. 0.04 mg/yr; the rate of change of dosage with respect to age

d. 0.04 mg/yr; the rate of change of age with respect to dosage

e. 36 mg; the dosage for a newborn

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.02.11 - Solve applied problems involving rates of change. |
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10. Biologists have noticed that the chirping rate of crickets of a certain species is related to temperature, and the relationship appears to be very nearly linear. A cricket produces 108 chirps per minute at 70°F and 228 chirps per minute at 90°F. Find a linear equation that models the temperature $T$ as a function of the number of chirps per minute $N$.

    a. $T(N) = \frac{1}{6}N + \frac{312}{6}$

    b. $T(N) = \frac{1}{6}N - \frac{312}{6}$

    c. $T(N) = 6N - 648$

    d. $N(T) = 6T - 312$

    e. $N(T) = -6T + 312$

    *ANSWER:* a
    *POINTS:* 1
    *QUESTION TYPE:* Multiple Choice
    *HAS VARIABLES:* True
    *LEARNING OBJECTIVES:* PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation.
    *DATE CREATED:* 3/23/2016 2:10 AM
    *DATE MODIFIED:* 1/29/2020 6:21 AM

11. Classify the following function:
    $f(x) = x^6(9x^4 - 4)$

    a. Polynomial function

    b. Power function

    c. Trigonometric function

    d. Rational Function

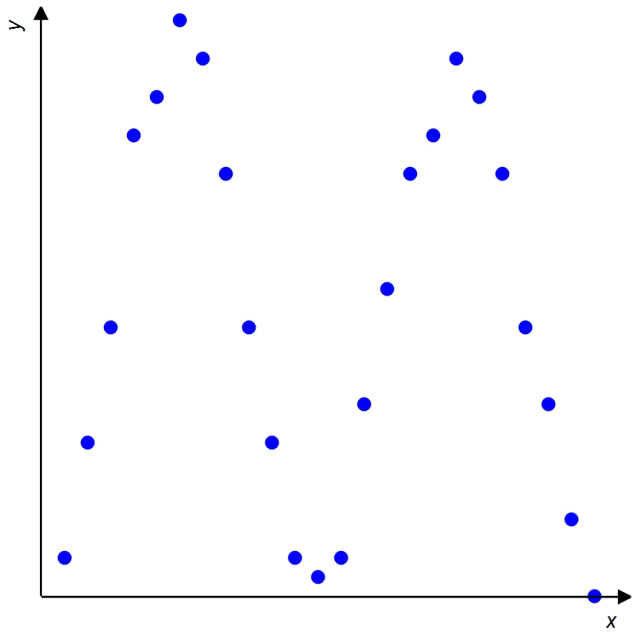
    e. Exponential function

    *ANSWER:* a
    *POINTS:* 1
    *QUESTION TYPE:* Multiple Choice
    *HAS VARIABLES:* True
    *LEARNING OBJECTIVES:* PCALC.COH.LO.02.01.01 - Define polynomial function.
    *DATE CREATED:* 3/23/2016 2:28 AM
    *DATE MODIFIED:* 2/17/2020 2:26 AM

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12. For the scatter plot below, what type of function might you see as a model for the data?




a. Trigonometric function
b. Rational Function
c. Exponential Function
d. Power Function
e. Polynomial Function

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.03.01 - Identify graphs and properties of common functions. |
| *DATE CREATED:* | 3/23/2016 2:32 AM |
| *DATE MODIFIED:* | 2/10/2020 2:17 AM |

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13. Find an equation for the family of linear functions such that $f(6) = 5$.

    a. $f(x) = 5 + m(x - 6)$

    b. $f(x) = m(x - 6) - 5$

    c. $f(x) = 6 + m(x - 5)$

    d. $f(x) = m(x + 5) - 5$

    e. $f(x) = mx + 6m - 5$

    *ANSWER:* a
    *POINTS:* 1
    *QUESTION TYPE:* Multiple Choice
    *HAS VARIABLES:* True
    *LEARNING OBJECTIVES:* PCALC.COH.LO.01.01.11 - Express a function algebraically, given its verbal or numerical representation.
    *DATE CREATED:* 3/23/2016 2:35 AM
    *DATE MODIFIED:* 1/31/2020 12:37 AM

14. The manager of a weekend flea market knows from past experience that if he charges $x$ dollars for a rental space at the market, then the number $y$ of spaces he can rent is given by the equation $y = 560 - 8x$. What does the $x$-intercept indicate?

    a. There will be no spaces occupied when the rental cost is $70.

    b. There will be no spaces occupied when the rental cost is $560.

    c. There will be 560 spaces occupied when there is no rental cost.

    d. There will be 8 spaces occupied when there is no rental cost.

    e. The number of occupied spaces decreases by 5 for every $1 increase in rent.

    *ANSWER:* a
    *POINTS:* 1
    *QUESTION TYPE:* Multiple Choice
    *HAS VARIABLES:* True
    *LEARNING OBJECTIVES:* PCALC.COH.LO.01.01.10 - Express a function verbally, given its numerical or algebraic representation.
    *DATE CREATED:* 3/23/2016 2:39 AM
    *DATE MODIFIED:* 1/29/2020 6:55 AM

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15. At the surface of the ocean, the water pressure is the same as the air pressure above the water, $13\ \text{lb}/\text{in}^2$. Below the surface, the water pressure increases by $4.34\ \text{lb}/\text{in}^2$ for every 10 ft of descent. At approximately what depth is the pressure $120\ \text{lb}/\text{in}^2$?

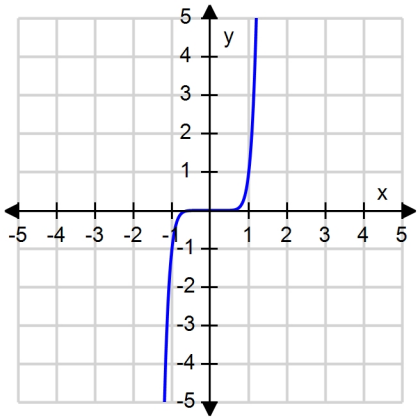
    a. 247 ft
    b. 276 ft
    c. 30 ft
    d. 56 ft
    e. 359 ft

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.12 - Express a function numerically, given its verbal, algebraic,or graphical representation. |
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16. What is the equation of this graph?




a. $y = x^4$

b. $y = x^8$

c. $y = x^{10}$

d. $y = \sqrt[3]{x}$

e. $y = x^9$

| | |
|---|---|
| *ANSWER:* | e |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.40 SCalc7e 1.1.40 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.02.01.10 - Write an equation for a polynomial function, given its graph. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e 1.1.40 |
| *DATE CREATED:* | 7/20/2015 1:44 PM |
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17. Find the domain of the function.

$$f(x) = \frac{7x + 5}{x^2}$$

a. $(-\infty, 0)$

b. $\left(-\infty, -\frac{5}{7}\right) \cup \left(-\frac{5}{7}, \infty\right)$

c. $\left(-\infty, \frac{5}{7}\right) \cup \left(\frac{5}{7}, \infty\right)$

d. $(-\infty, 0) \cup (0, \infty)$

| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | SCalcET7 1.1.31 SCalc7e 1.1.31 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.07 - Find the domain of a function algebraically. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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**1.2 A Catalog of Essential Functions**

18. Find the domain of the function $f(x) = \dfrac{x}{7\sin x - 8}$

a. $(-\infty, \infty)$

b. $\left[\dfrac{8}{7}, \infty\right)$

c. $[-8, 7]$

d. $[-7, 8]$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | SCalcET7 1.1.32 SCalc7e 1.1.32 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.07 - Find the domain of a function algebraically. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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19. Find $a$, such that the function $f(x) = 4x + \sqrt{a - x^2}$ has the domain $[-3, 3]$.

a. $a = -9$
b. $a = \sqrt{3}$
c. $a = -\sqrt{3}$
d. $a = 9$
e. $a = 3$

| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.38 SCalc7e 1.1.38 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.07 - Find the domain of a function algebraically. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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20. Find the domain.

$$g(u) = \sqrt{u} - \sqrt{3 - u}$$

a. (0, 3)
b. (–∞, 0]
c. (–3, ∞]
d. [0, 3]
e. [0, ∞)

| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.34 SCalc7e 1.1.34 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.07 - Find the domain of a function algebraically. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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21. Find the range of the function.

$y = 4 + \cos x$

a. $(-\infty, \infty)$
b. $(2, \infty)$
c. $[-1, 1]$
d. $(-1, 3)$
e. $[3, 5]$

| | |
|---|---|
| *ANSWER:* | e |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.38 SCalc7e 1.1.38 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.05.04.03 - Find the domain and range of the cosine function. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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22. Find the domain of the function.

$$f(x) = \frac{7}{3x - 1}$$

*ANSWER:* $\left\{x \mid x \neq \frac{1}{3}\right\}$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* SCalcET7 1.1.31 SCalc7e 1.1.31
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.01.07 - Find the domain of a function algebraically.
*OTHER:* Numerical Response
*NOTES:* SCalcET7 Section 1.1 SCalc7e Section 1.1
*DATE CREATED:* 7/20/2015 1:44 PM
*DATE MODIFIED:* 1/30/2020 8:47 AM

23. Find the domain of the function.

$$f(x) = \sqrt{25 - x^2}$$

*ANSWER:* [–5, 5]
*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* SCalcET7 1.1.38 SCalc7e 1.1.38
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.01.07 - Find the domain of a function algebraically.
*OTHER:* Numerical Response
*NOTES:* SCalcET7 Section 1.1 SCalc7e Section 1.1
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24. Find the range of the function.

$h(x) = \sqrt{36 - x^2}$

| | |
|---|---|
| *ANSWER:* | $0 \le h(x) \le 6$ |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.38 SCalc7e 1.1.38 |
| *QUESTION TYPE:* | Numeric Response |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.03 - Define range of a function. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Numerical Response |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
| *DATE CREATED:* | 7/20/2015 1:44 PM |
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25. It makes sense that the larger the area of a region, the larger the number of species that inhabit the region. Many ecologists have modeled the species-area relation with a power function. In particular, the number of species $S$ of bats living in caves in central Mexico has been related to the surface area $A$ of the caves by the equation $S = 0.7A^{0.3}$. If you discover that nine species of bats live in a cave, estimate the area of the cave.

a. $4979\ \text{m}^2$

b. $1.35\ \text{m}^2$

c. $2125\ \text{m}^2$

d. $2.15\ \text{m}^2$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.01.08 - Evaluate functions for given values of the independent variable. |
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| *DATE MODIFIED:* | 2/12/2021 4:55 AM |

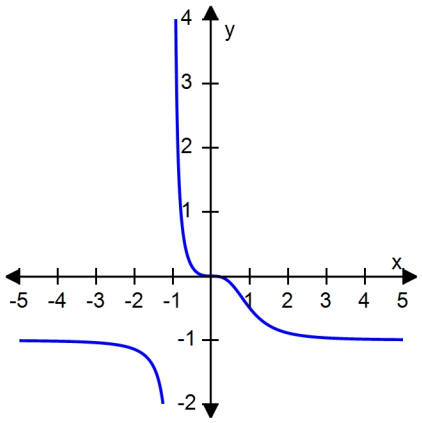
26. Plot the graph of the function $f$ in an appropriate viewing window.

$f(x) = \dfrac{x^3}{x^3 + 1}$

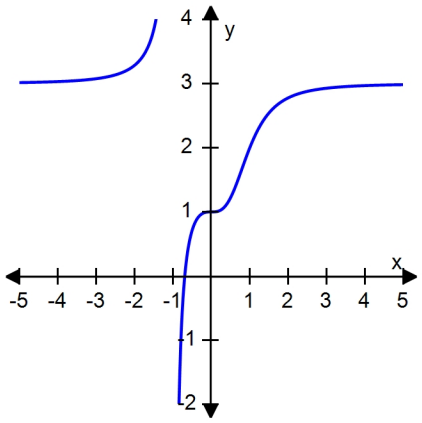
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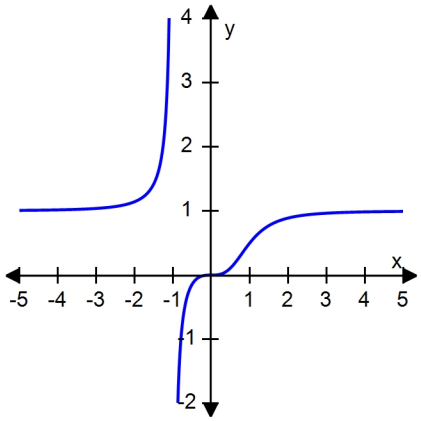
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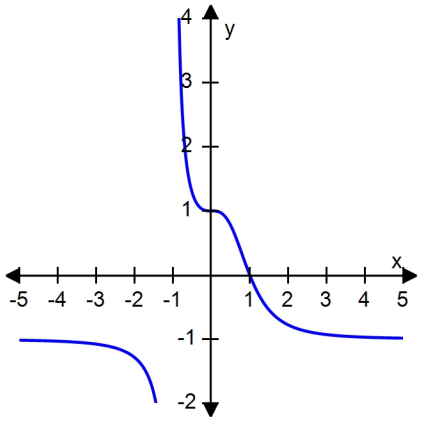

a.




b.




c.




d.

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 2.3.50a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.02.04.11 - Sketch graphs of rational functions using intercepts, asymptotes, zeros, and test values. |
| *KEYWORDS:* | 7e |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 2.3 |
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27. Identify the type of the following function.

$h(r) = 3.6^r$

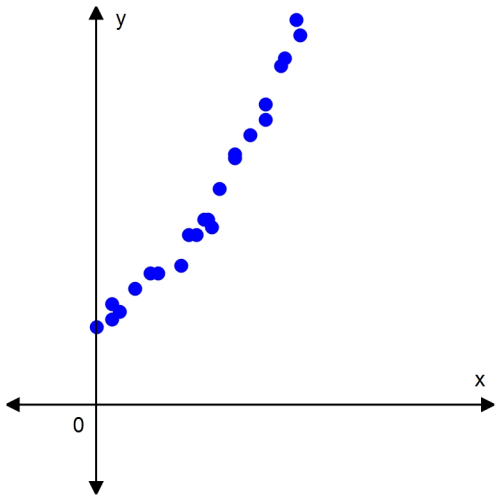
a. power function
b. root function
c. polynomial
d. rational function
e. algebraic function
f. trigonometric function
g. exponential function
h. logarithmic function

*ANSWER:* g
*POINTS:* 1
*QUESTION TYPE:* Multiple Choice
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.03.01.01 - Define exponential function.
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28. Decide what type of function you might choose as a model for the data displayed on the scatter plot.




a. exponential function
b. logarithmic function
c. polynomial
d. rational function
e. trigonometric function

*ANSWER:* a
*POINTS:* 1
*QUESTION TYPE:* Multiple Choice
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.03.01.01 - Define exponential function.
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29. Determine the domain and range of the function $f(x) = 3^x$.

a. Domain: $(-\infty, \infty)$, range: $(0, \infty)$
b. Domain: $(0, \infty)$, range: $(-\infty, \infty)$
c. Domain: $(0, \infty)$, range: $(0, \infty)$
d. Domain: $(-\infty, \infty)$, range: $(-\infty, \infty)$
e. Domain: $(-\infty, \infty)$, range: $(3, \infty)$
f. Domain: $(3, \infty)$, range: $(-\infty, \infty)$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.04 - Find the domain and range of exponential functions. |
| *DATE CREATED:* | 2/12/2021 4:39 AM |
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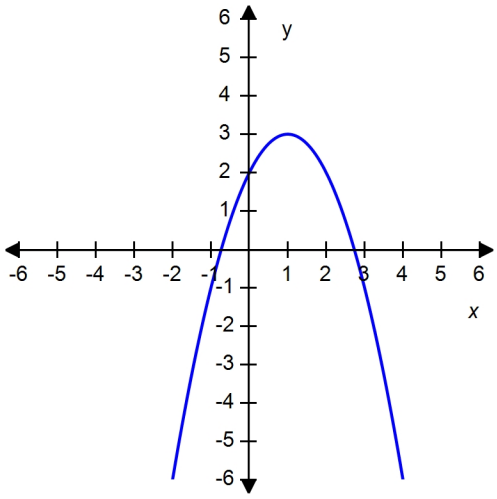
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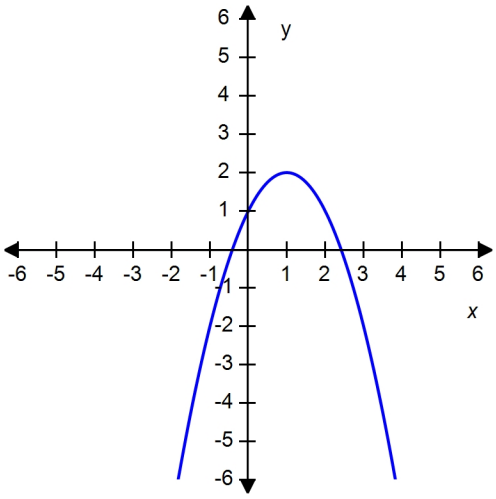
**1.3 New Functions from Old Functions**

1. Graph the function by hand, not by plotting points, but by starting with the graph of one of the standard functions and then applying the appropriate transformations.

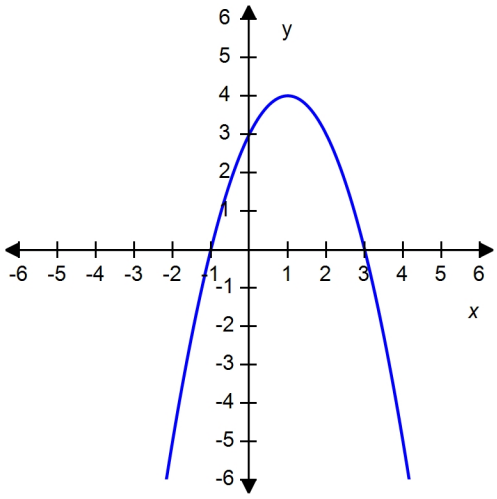
$y = 3 + 2x - x^2$



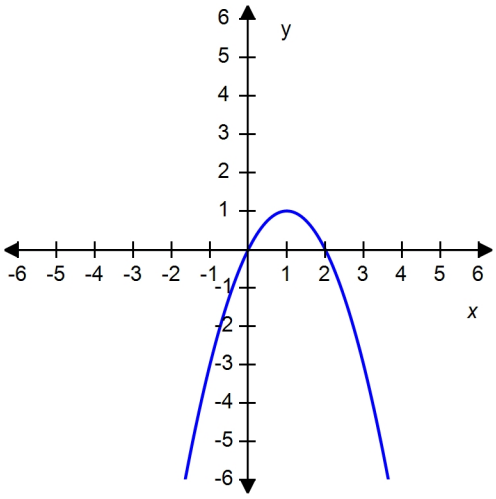

a.




b.




c.




d.

*ANSWER:* c
*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* SCalcET7 1.3.12 SCalc7e 1.3.12
*QUESTION TYPE:* Multi-Mode (Multiple choice)
*HAS VARIABLES:* True

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| | |
|---|---|
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.03.11 - Sketch the transformed graph of a function, given its transformed equation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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2. If $f(x) = x + 15$ and $h(x) = 4x + 85$, find a function $g$ such that $g \circ f = h$.

a. $g(x) = 4x + 25$
b. $g(x) = 4x$
c. $g(x) = x - 25$
d. $g(x) = 4x - 25$
e. $g(x) = x + 25$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.61b SCalc7e 1.3.61b |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.06.06 - Combine functions using function composition. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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**1.3 New Functions from Old Functions**

3. Use the table to evaluate the expression $(f \circ g)(4)$.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| $f(x)$ | 3 | 2 | 1 | 0 | 1 | 2 |
| $g(x)$ | 6 | 5 | 2 | 3 | 4 | 6 |

a. 4

b. 1

c. 2

d. 3

e. 5

| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.50f SCalc7e 1.3.50f |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.06.06 - Combine functions using function composition. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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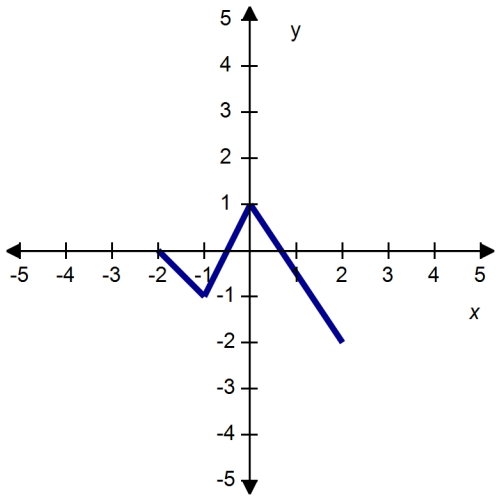
**1.3 New Functions from Old Functions**

4. What is $\sqrt[10]{x}$, given that $H = h \circ f \circ g$ and $H(x) = \sqrt[10]{\sqrt{x} - 3}$?

a. $g(x)$
b. $f(x)$
c. $h(x)$

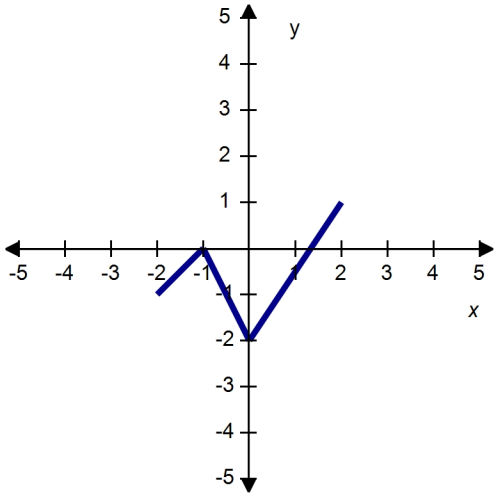
| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.47 SCalc7e 1.3.47 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.06.08 - Identify the functions that make up a composite function. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
| *DATE CREATED:* | 7/20/2015 1:45 PM |
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5. The graph of the function $f$ follows. Choose the graph of $y = -f(x) - 1$.

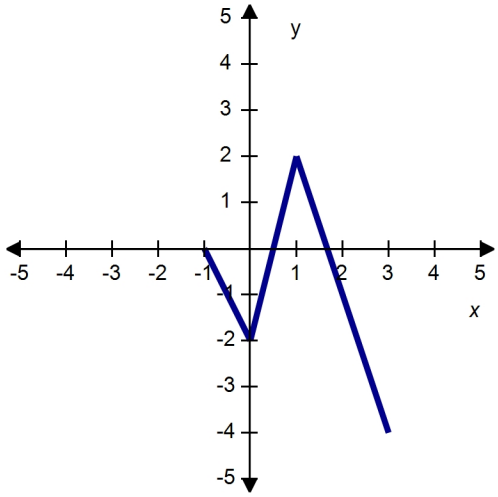



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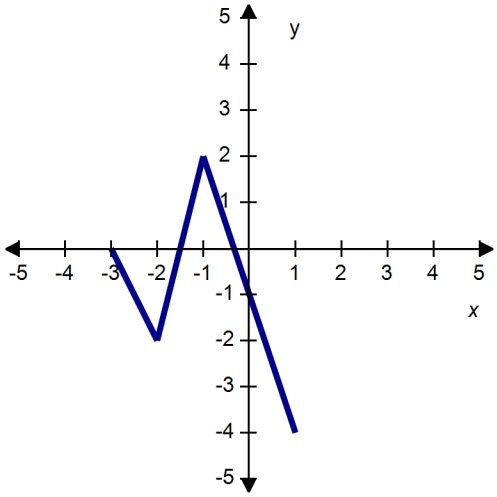



a.

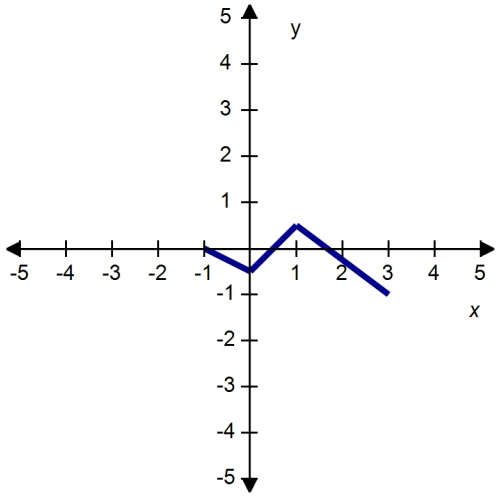



b.

c.




d.




| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.5b SCalc7e 1.3.5b |
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| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.03.11 - Sketch the transformed graph of a function, given its transformed equation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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## 1.3 New Functions from Old Functions

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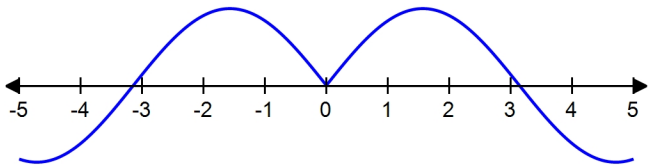


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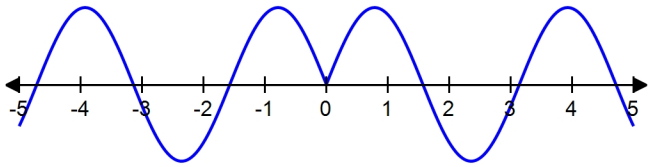
6. Which of the following graphs is the graph of the function?

$f(x) = \sin|2x|$

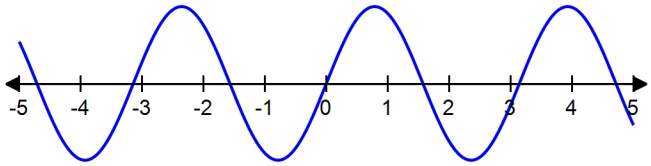
Graph 1




Graph 2




Graph 3




a. Graph 2

b. Graph 1

c. Graph 3

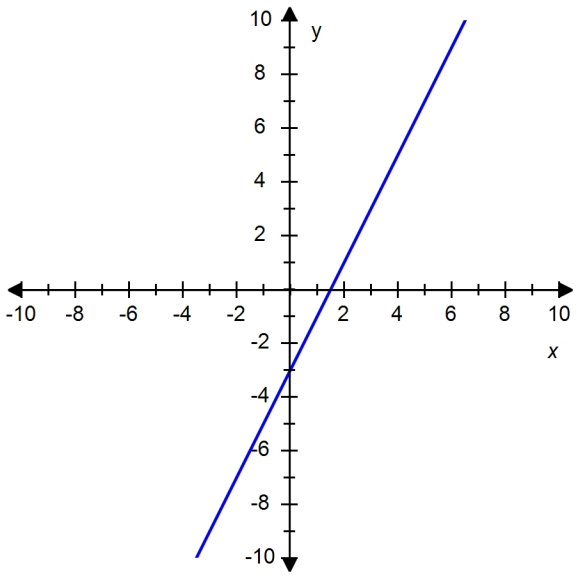
| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.24 SCalc7e 1.3.24 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.03.11 - Sketch the transformed graph of a function, given its transformed equation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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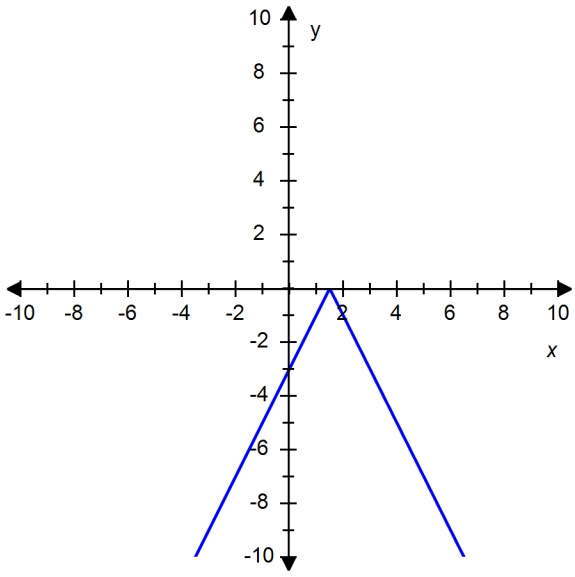
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7. The graph of the function $f$ follows. Choose the graph of $y = f(|x|)$.

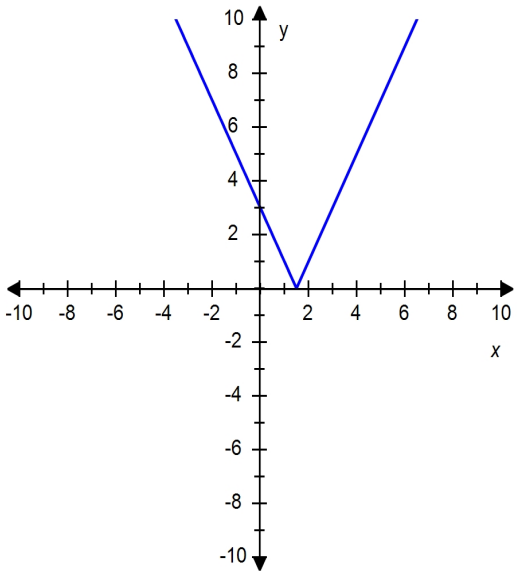



a.

b.




c.

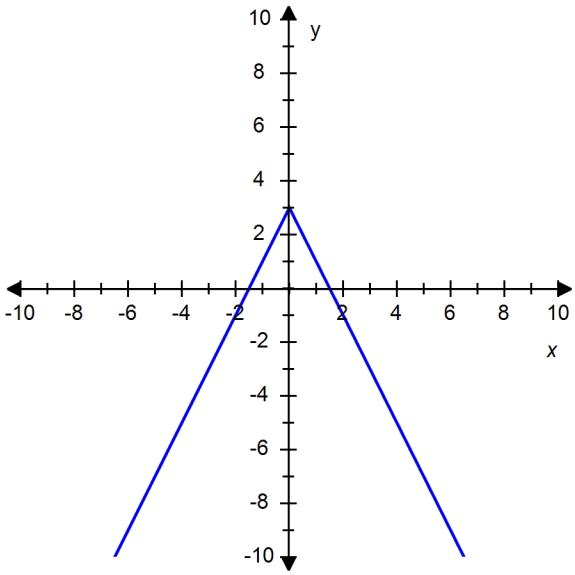


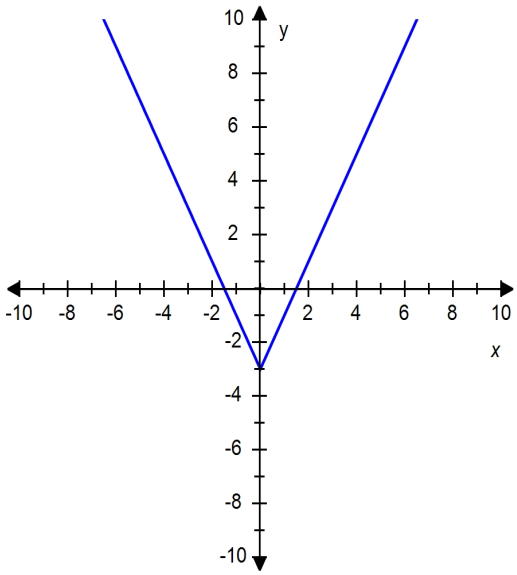

d.

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| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.27a SCalc7e 1.3.27a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.03.11 - Sketch the transformed graph of a function, given transformed equation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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**1.3 New Functions from Old Functions**

8. Suppose that the graph of $f$ is given. Describe how the graph of the function $y = f(x - 3) - 3$ can be obtained from the graph of $f$.

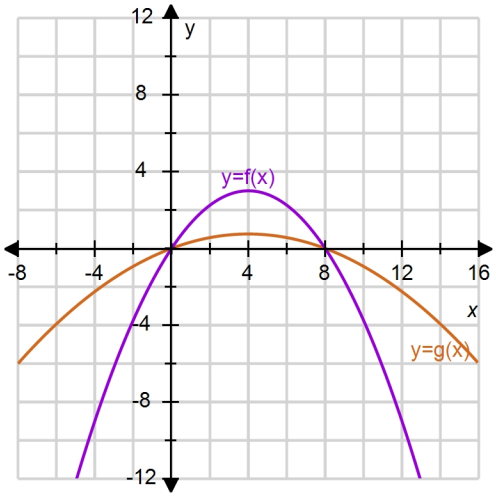
   a. Shift the graph 3 units to the left and 3 units down.
   b. Shift the graph 3 units to the left and 3 units up.
   c. Shift the graph 3 units to the right and 3 units up.
   d. Shift the graph 3 units to the right and 3 units down.
   e. None of these

| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.1bc SCalc7e 1.3.1bc |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.03.10 - Describe the transformations applied tthe graph of a function, given its transformed equation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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9. Which of the following is the equation for the function $g(x)$?




a. $g(x) = 4f(x)$

b. $g(x) = f(x) - 4$

c. $g(x) = -f(x+4)$

d. $g(x) = \dfrac{f(x)}{4}$

e. $g(x) = -f(x) + 4$

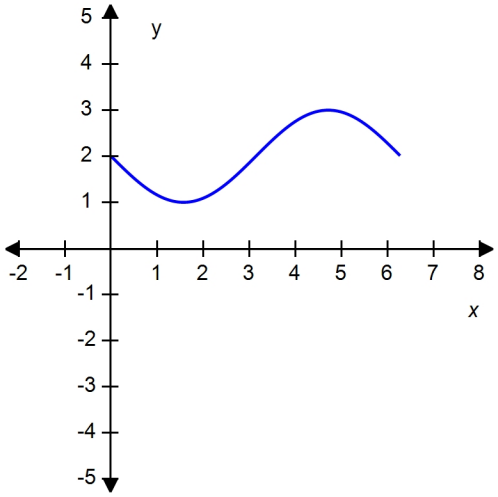
| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.3c SCalc7e 1.3.3c |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.03.14 - Write an equation for a given transformed graph of a common function. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
| *DATE CREATED:* | 7/20/2015 1:45 PM |
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10. Sketch the graph of $y = 2 - \cos x$ over one period.

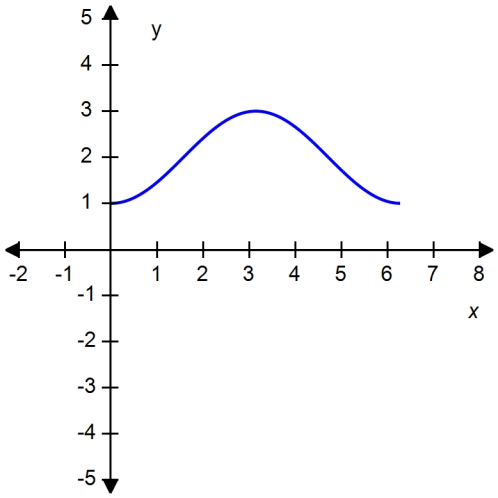
a. b.

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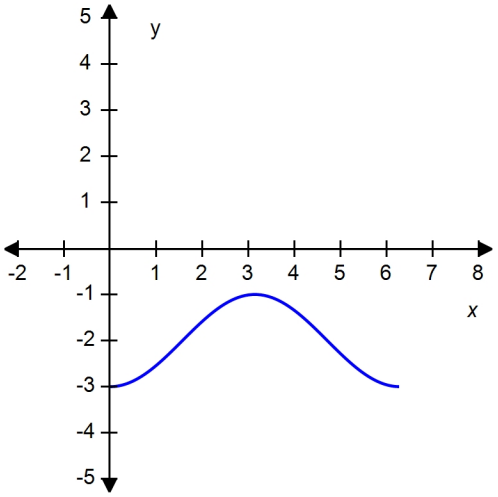

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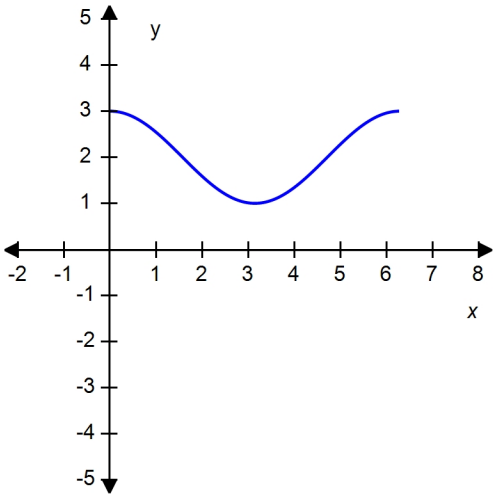



c.




d.




| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | SCalcET7 1.3.27b SCalc7e 1.3.27b |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.03.11 - Sketch the transformed graph of a function, given its transformed equation. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |

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**1.3 New Functions from Old Functions**

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11. Find the function $f \circ g$ and its domain if $f(x) = \sqrt{x+6}$ and $g(x) = \sqrt{x-6}$.

a. $\sqrt{x^2 - 36}$
$D = [6, \infty)$

b. $\sqrt{x^2 - 36}$
$D = [-6, \infty)$

c. $\sqrt{x^2 + 36}$
$D = [-6, \infty)$

d. $\sqrt{x^2 + 36}$
$D = [6, \infty)$

*ANSWER:* a
*POINTS:* 1
*DIFFICULTY:* Easy
*REFERENCES:* SCalcET7 1.3.29 SCalc7e 1.3.29
*QUESTION TYPE:* Multiple Choice
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.06.07 - Find the domain of a composite function.
*OTHER:* Bimodal
*NOTES:* SCalcET7 Section 1.3 SCalc7e Section 1.3
*DATE CREATED:* 7/20/2015 1:45 PM
*DATE MODIFIED:* 1/18/2021 10:56 AM

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**1.3 New Functions from Old Functions**

12. Find the function $f \circ g$ and its domain if $f(x) = \dfrac{x-1}{x}$ and $g(x) = \dfrac{x}{x+5}$.

a. $\dfrac{x-1}{x+5}, D = (-\infty, -5) \cup (-5, 0) \cup (0, \infty)$

b. $\dfrac{x-1}{x+5}, D = (-\infty, -5) \cup (-5, \infty)$

c. $-\dfrac{5}{x}, D = (-\infty, -5) \cup (-5, 0) \cup (0, \infty)$

d. $-\dfrac{5}{x}, D = (-\infty, 0) \cup (0, \infty)$

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.35a SCalc7e 1.3.35a |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.06.07 - Find the domain of a composite function. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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**1.3 New Functions from Old Functions**

13. The graph of the function $f(x) = x^2 - 8x + 4$ has been shifted horizontally to the left by 9 units. Find the function for the transformed graph.

a. $g(x) = x^2 - 8x - 5$

b. $g(x) = x^2 - 8x + 13$

c. $g(x) = x^2 + 10x + 13$

d. $g(x) = x^2 - 26x + 157$

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.1g SCalc7e 1.3.1g |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.03.13 - Write an equation for the transformed graph of a function, given its verbal description. |
| *OTHER:* | Bimodal |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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**1.3 New Functions from Old Functions**

14. Express the function in the form of $f \circ g \circ h$.

$H(x) = 3 - 5^{x^3}$

*ANSWER:* $h(x) = x^3,\ g(x) = 5^x,\ f(x) = 3 - x$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* SCalcET7 1.3.48 SCalc7e 1.3.48
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.06.08 - Identify the functions that make up a composite function.
*OTHER:* Numerical Response
*NOTES:* SCalcET7 Section 1.3 SCalc7e Section 1.3
*DATE CREATED:* 7/20/2015 1:45 PM
*DATE MODIFIED:* 1/30/2020 2:34 AM

15. A spherical balloon with radius $r$ inches has volume $4\dfrac{\pi r^3}{3}$.

Find a function that represents the amount of air required to inflate the balloon from a radius of $r$ inches to a radius of $r + 2$ inches.

*ANSWER:* $\dfrac{8}{3}\pi(6r^2 + 12r + 8)$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* SCalcET7 1.3.54 SCalc7e 1.3.54
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.03.13 - Write an equation for the transformed graph of a function, given its verbal description.
*OTHER:* Numerical Response
*NOTES:* SCalcET7 Section 1.3 SCalc7e Section 1.3
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*DATE MODIFIED:* 2/5/2020 8:53 AM

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**1.3 New Functions from Old Functions**

16. Express the function in the form of $f \circ g$.

$v(t) = \tan(t^2)\sin(t^2)$

*ANSWER:* $f(t) = \tan(t)\sin(t)$
$g(t) = t^2$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* SCalcET7 1.3.45 SCalc7e 1.3.45
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.06.08 - Identify the functions that make up a composite function.
*OTHER:* Numerical Response
*NOTES:* SCalcET7 Section 1.3 SCalc7e Section 1.3
*DATE CREATED:* 7/20/2015 1:45 PM
*DATE MODIFIED:* 1/18/2021 10:56 AM

17. A stone is dropped into a lake, creating a circular ripple that travels outward at a speed of 49 cm/s. Express the radius $r$ of this circle as a function of the time $t$ (in seconds) and find $A \circ r$, if $A$ is the area of this circle as a function of the radius.

*ANSWER:* $r(t) = 49t,\ 2401\pi t^2$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* SCalcET7 1.3.53 SCalc7e 1.3.53
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.06.09 - Solve applied problems involving combinations of functions.
*OTHER:* Numerical Response
*NOTES:* SCalcET7 Section 1.3 SCalc7e Section 1.3
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*DATE MODIFIED:* 1/30/2020 3:55 AM

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**1.3 New Functions from Old Functions**

18. Let $f(x) = x^2 - 18x + 81$ and $g(x) = \sqrt{x+1}$. Find $(f \circ f)(12)$.

| | |
|---|---|
| *ANSWER:* | 0 |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | SCalcET7 1.3.36 SCalc7e 1.3.36 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.06.06 - Combine functions using function composition. |
| *OTHER:* | Short Answer |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
| *DATE CREATED:* | 7/20/2015 1:45 PM |
| *DATE MODIFIED:* | 3/4/2020 5:38 AM |

19. Find $f \circ g \circ h$ if

$f(x) = \sqrt{x}$, $g(x) = 3x + 1$, and $h(x) = x^2 - 1$

| | |
|---|---|
| *ANSWER:* | $\sqrt{3x^2 - 2}$ |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.3.37 SCalc7e 1.3.37 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.06.06 - Combine functions using function composition. |
| *OTHER:* | Short Answer |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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**1.3 New Functions from Old Functions**

20. Find the function $g$ such that $h(x) = (g \circ f)(x)$.

$h(x) = \sin^5 x$ and $f(x) = \sin x$

*ANSWER:* $g(x) = x^5$

| | |
|---|---|
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | SCalcET7 1.3.62 SCalc7e 1.3.62 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.06.08 - Identify the functions that make up a composite function. |
| *OTHER:* | Short Answer |
| *NOTES:* | SCalcET7 Section 1.3 SCalc7e Section 1.3 |
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**1.4 Exponential Functions**

1. Use the Law of Exponents to rewrite and simplify the expression.

$$\frac{\sqrt{a\sqrt{b}}}{\sqrt[6]{ab}}$$

a. $\left(\frac{a}{b}\right)^{\frac{1}{3}}$

b. $\frac{a^{\frac{1}{3}}}{b^{\frac{1}{12}}}$

c. $\frac{a}{b}$

d. $\frac{a}{b^{\frac{1}{12}}}$

e. $a^{\frac{1}{3}}b^{\frac{1}{12}}$

| | |
|---|---|
| *ANSWER:* | e |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.5.4b |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.01 - Define exponential function. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.5 |
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**1.4 Exponential Functions**

2. Starting with the graph of $y = e^x$, find the equation of the graph that results from reflecting about the line $y = 5$.

a. $y = -e^x$

b. $y = -e^x + 10$

c. $y = -e^{-5x} + 10$

d. $y = e^{-x} + 10$

e. $y = -e^{x+10}$

| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.5.18a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.06 - Given its graph, write an equation for an exponential function. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
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3. Use the Law of Exponents to rewrite and simplify the expression.

$$\frac{x^{4n} \cdot x^{5n+1}}{x^{n-4}}$$

a. $x^{8n+5}$

b. $x^{8n+6}$

c. $x^{6n-9}$

d. $x^{3n+8}$

e. $x^{4n-7}$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.5.4a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.01 - Define exponential function. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
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## 1.4 Exponential Functions

4. Starting with the graph of $y = e^x$, write the equation of the graph that results from shifting 6 units right.

a. $y = e^{x+6}$

b. $y = e^x - 6$

c. $y = e^{x-6}$

d. $y = e^x + 6$

e. $y = 6e^{x-6}$

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.5.18b |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.06 - Given its graph, write an equation for an exponential function. |
| *KEYWORDS:* | 7ET |
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5. The table gives the population of the United States, in millions, for the years 1900 - 2000. Use a graphing calculator with exponential regression capability to model the U.S. population since 1900. Use the model to estimate the population in 1965 and to predict the population in the year 2025.

| Year | 1900 | 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Population (millions) | 76 | 92 | 106 | 123 | 131 | 150 | 179 | 203 | 227 | 250 | 281 |

a. 185 million, 400 million

b. 190 million, 405 million

c. 195 million, 410 million

d. 180 million, 395 million

e. 175 million, 390 million

*ANSWER:* a
*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* 1.5.32
*QUESTION TYPE:* Multi-Mode (Multiple choice)
*HAS VARIABLES:* True
*STUDENT ENTRY MODE:* Basic
*LEARNING OBJECTIVES:* PCALC.COH.LO.03.01.10 - Solve applied problems involving exponential functions.
*KEYWORDS:* 7ET
*OTHER:* Bimodal
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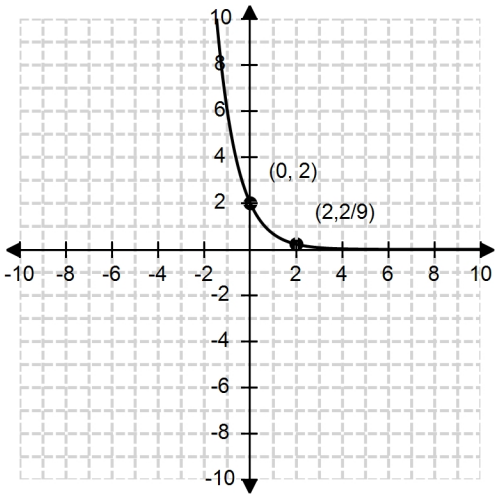

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6. Under ideal conditions a certain bacteria population is known to double every three hours. Suppose that there are initially 20 bacteria. What is the size of the population after 15 hours?

   a. 1,280 bacteria
   b. 80 bacteria
   c. 640 bacteria
   d. 160 bacteria
   e. 320 bacteria

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.5.29a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.10 - Solve applied problems involving exponential functions. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.5 |
| *DATE CREATED:* | 7/20/2015 1:45 PM |
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7. Find the exponential function $y = Ca^x$ whose graph is given.




   a. $f(x) = 2\left(\frac{1}{3}\right)^x$

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b. $f(x) = 3\left(\frac{1}{3}\right)^x$

c. $f(x) = \left(\frac{3}{2}\right)$

d. $f(x) = \frac{1}{3^x}$

e. $f(x) = \left(\frac{3}{4}\right)^x$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.5.21 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.06 - Given its graph, write an equation for an exponential function. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.5 |
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8. The half-life of bismuth-210, $^{210}Bi$, is 5 days. If a sample has a mass of 600 mg, find the amount remaining after 4 weeks. Round your answer to one decimal place.

   a. 12.4 mg
   b. 29,102 mg
   c. 0 mg
   d. 82.8 mg
   e. 6,000 mg

   *ANSWER:* a
   *POINTS:* 1
   *QUESTION TYPE:* Multiple Choice
   *HAS VARIABLES:* True
   *LEARNING OBJECTIVES:* PCALC.COH.LO.03.01.10 - Solve applied problems involving exponential functions.
   *DATE CREATED:* 3/22/2016 9:17 AM
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9. An isotope of sodium, $^{24}Na$, has a half-life of 15 hours. A sample of this isotope has mass 9 g. Estimate the time required for the mass to be reduced to 0.5 g.

   a. 62.5 hours
   b. 2.1 hours
   c. 70.3 hours
   d. 47.5 hours
   e. 125.1 hours

   *ANSWER:* a
   *POINTS:* 1
   *QUESTION TYPE:* Multiple Choice
   *HAS VARIABLES:* True
   *LEARNING OBJECTIVES:* PCALC.COH.LO.03.01.10 - Solve applied problems involving exponential functions.
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## 1.4 Exponential Functions

10. Find the domain of the following function.

$$f(x) = \frac{1 - e^{x^2}}{1 - e^{36 - x^2}}$$

a. $\mathbb{R}$

b. $x \neq 0$

c. $0 < x < 6$

d. $x \neq \pm 36$

e. $x \neq \pm 6$

| | |
|---|---|
| *ANSWER:* | e |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.04 - Find the domain and range of exponential functions. |
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11. After alcohol is fully absorbed into the body, it is metabolized with a half-life of about 1.25 hours. Suppose you have had three alcoholic drinks and an hour later, at midnight, your blood alcohol concentration (BAC) is 0.6 mg/mL. Find an exponential decay model for your BAC $t$ hours after midnight.

a. $\text{BAC}(t) = 0.6 \cdot (2)^{-\frac{4t}{5}}$

b. $\text{BAC}(t) = 1.25 \cdot (2)^{-\frac{t}{0.6}}$

c. $\text{BAC}(t) = 0.6 \cdot \left(\frac{1}{2}\right)^{1.25t}$

d. $\text{BAC}(t) = 1.25 \cdot \left(\frac{1}{2}\right)^{0.6t}$

e. None of the above

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.10 - Solve applied problems involving exponential functions. |
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12. Determine the range of the following function.

$g(x) = -2^{-x} - 9$

a. $(-\infty, -9)$

b. $(9, \infty)$

c. $\mathbb{R}$

d. $(-9, \infty)$

e. $(0, -\infty)$

*ANSWER:* a
*POINTS:* 1
*QUESTION TYPE:* Multiple Choice
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.03.01.04 - Find the domain and range of exponential functions.
*DATE CREATED:* 3/22/2016 10:11 AM
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13. Use the Law of Exponents to rewrite and simplify the expression.

$$\frac{(4z^8)^8}{2z^9}$$

a. $32{,}768z^{55}$

b. $65{,}536z^{55}$

c. $32{,}768z^8$

d. $2z^{55}$

e. $2z^8$

*ANSWER:* a
*POINTS:* 1
*QUESTION TYPE:* Multiple Choice
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.03.01.01 - Define exponential function.
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14. Identify the graph of the following function.

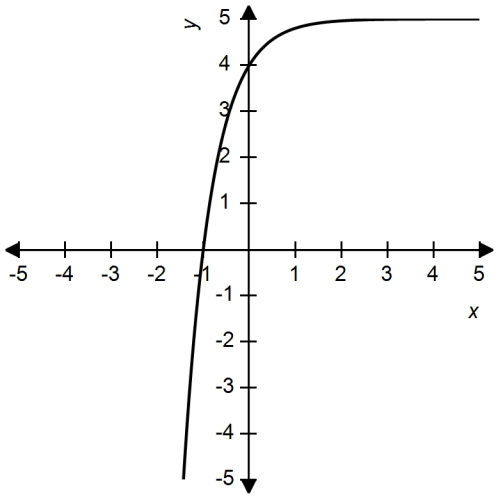
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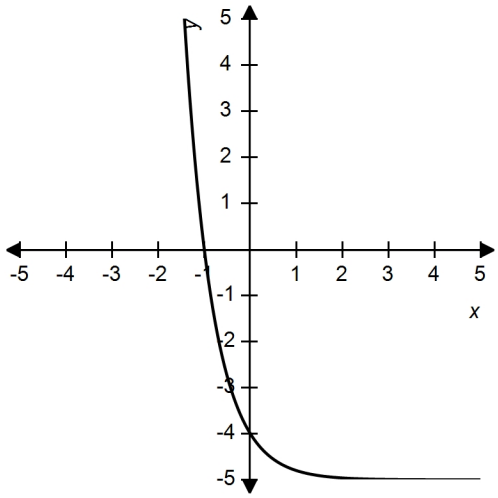
**1.4 Exponential Functions**

$y = 5 - (0.2)^x$

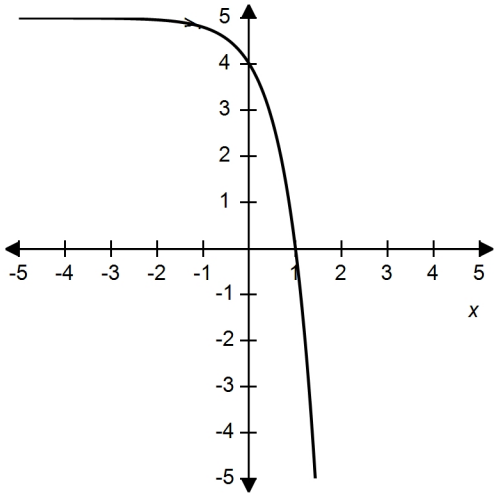
a.



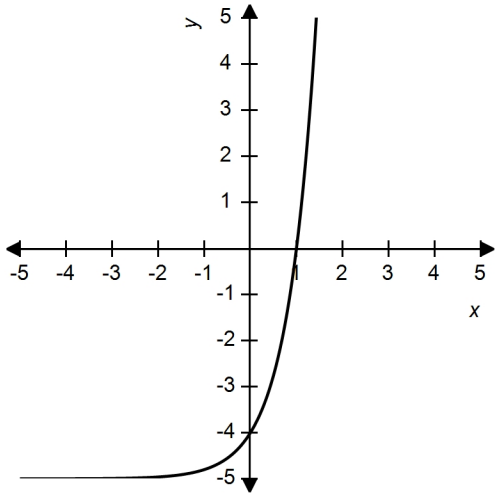

b.




c.




d.




*ANSWER:* a
*POINTS:* 1
*QUESTION TYPE:* Multiple Choice
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.03.01.07 - Sketch graphs of transformations of exponential functions.
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## 1.4 Exponential Functions

15. Starting with the graph of $y = e^x$, write the equation of the graph that results from shifting 7 units to the left and 6 units upward.

a. $y = e^{x+7} + 6$

b. $y = e^{x+6} + 7$

c. $y = e^{x+7} - 6$

d. $y = e^{x-7} + 6$

e. $y = 6e^{x-7}$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *QUESTION TYPE:* | Multiple Choice |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.06 - Given its graph, write an equation for an exponential function. |
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16. Find the domain of the function.

$$f(x) = \frac{3}{1 - e^x}$$

| | |
|---|---|
| *ANSWER:* | $(-\infty, 0) \cup (0, \infty)$ |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | SCalcET7 1.1.42 SCalc7e 1.1.42 |
| *QUESTION TYPE:* | Numeric Response |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.04 - Find the domain and range of exponential functions. |
| *OTHER:* | Numerical Response |
| *NOTES:* | SCalcET7 Section 1.1 SCalc7e Section 1.1 |
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**1.5 Logarithms**

1. Determine whether the function is one-to-one.

$$f(x) = \sqrt{4 - x}$$

a. No

b. Yes

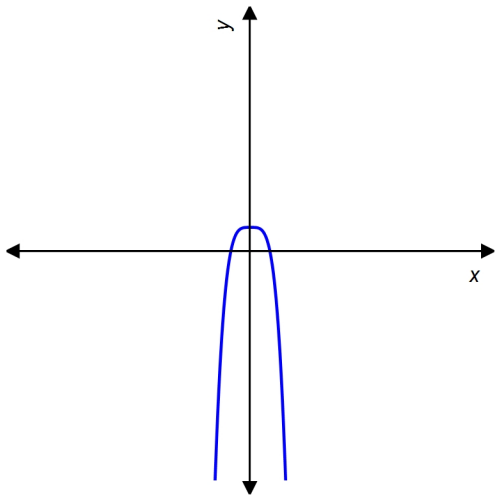
| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 1.6.9 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.05.03 - Given its equation, determine if a function is one-to-one. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
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2. Determine whether $f$ is one-to-one.




| | |
|---|---|
| *ANSWER:* | No |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 1.6.5 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.05.02 - Given its graph, determine if a function is one-to-one using the horizontal line test. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Short Answer |
| *NOTES:* | Section 1.6 |
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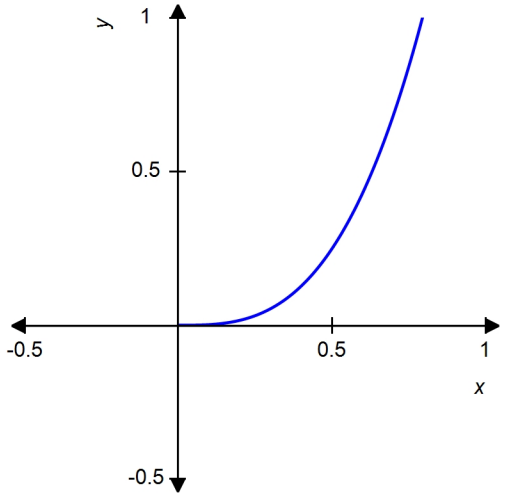
3. The graph of $f$ is given. Sketch the graph of $f^{-1}$ on the same set of axes.

$y = f(x)$

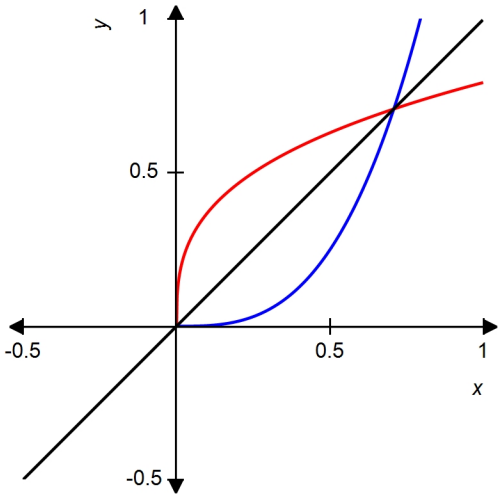
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**1.5 Logarithms**




*ANSWER:* $y = f(x)$ - blue, $y = f^{-1}(x)$ -red




*POINTS:* 1
*DIFFICULTY:* Easy
*REFERENCES:* 1.6.30
*QUESTION TYPE:* Subjective Short Answer
*HAS VARIABLES:* True
*STUDENT ENTRY MODE:* Basic
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.05.06 - Given the graph of a one-to-one function, sketch the graph of its inverse using symmetry.
*KEYWORDS:* 7ET
*OTHER:* Short Answer
*NOTES:* Section 1.6

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4. Find $f^{-1}(a)$ for the function $f$ and the real number $a$.

$f(x) = x^3 + x - 2;\ a = -4$

a. 0
b. –1
c. –2
d. 1

| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.6.16 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.05.09 - Evaluate the inverse of a one-to-one function given its numerical, algebraic, or graphical representation. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
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5. Find the inverse function of $f(x) = \dfrac{x + 1}{5x + 1}$.

a. $f^{-1}(x) = -(x + 1)(5x + 1)$

b. $f^{-1}(x) = -\dfrac{5x + 1}{x - 1}$

c. $f^{-1}(x) = -\dfrac{x - 1}{5x - 1}$

d. $f^{-1}(x) = \dfrac{x}{5x - 1}$

e. $f^{-1}(x) = (x + 1)(5x + 1)$

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.6.22 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.05.10 - Find the inverse of a function algebraically. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
| *DATE CREATED:* | 7/20/2015 1:46 PM |
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6. Find the inverse of $f$. Then sketch the graphs of $f$ and $f^{-1}$ on the same set of axes.

$f(x) = \sqrt{16 - x^2}, x \geq 0$

a. $f^{-1}(x) = -\sqrt{16 - x^2}, x \geq 0$

$f = f^{-1}$

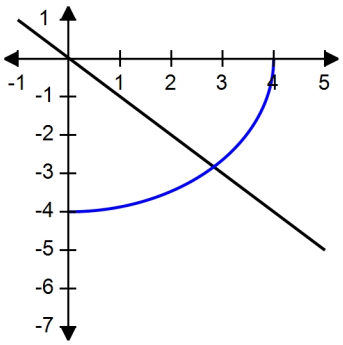
b. $f^{-1}(x) = \sqrt{4 + x^2}, x \geq 0$

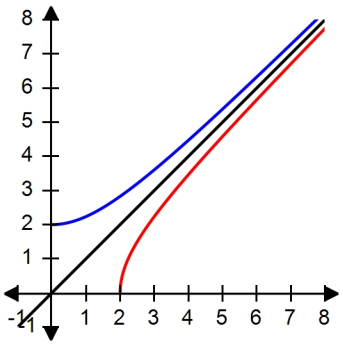
$f(blue), f^{-1}(red)$

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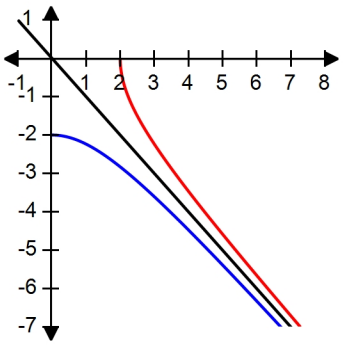
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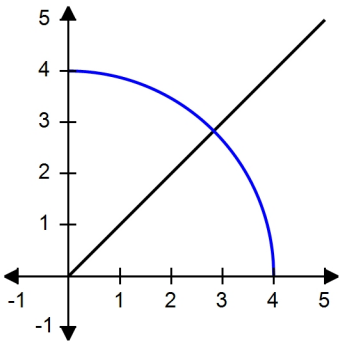

c. $f^{-1}(x) = -\sqrt{4 + x^2}, x \geq 0$

$f(blue), f^{-1}(red)$




d. $f^{-1}(x) = \sqrt{16 - x^2}, x \geq 0$

$f = f^{-1}$




| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 1.6.31 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.05.10 - Find the inverse of a function algebraically. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
| *DATE CREATED:* | 7/20/2015 1:46 PM |
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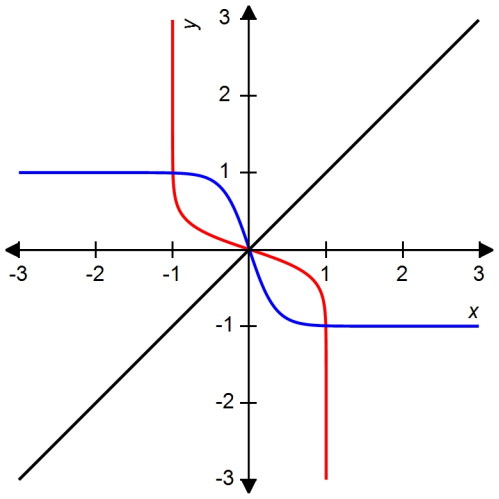
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**1.5 Logarithms**

7. Find the inverse of $f$. Then use a graphing utility to plot the graphs of $f$ and $f^{-1}$ on the same set of axes.

$$f(x) = \frac{1 - e^{6x}}{1 + e^{6x}}$$

*ANSWER:* $$f^{-1}(x) = \frac{1}{6}\ln\left(\frac{1 - x}{1 + x}\right)$$




| | |
|---|---|
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.6.26 |
| *QUESTION TYPE:* | Subjective Short Answer |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.02.09 - Graph logarithmic functions involving common and natural logarithms using a graphing tool. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Short Answer |
| *NOTES:* | Section 1.6 |
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**1.5 Logarithms**

8. Find the domain, range, and $x$-intercept(s) of the function.

$f(x) = \ln(x - 4) - 1$

*ANSWER:* Domain: $(4, \infty)$ Range: $(-\infty, \infty)$ $x$-intercept: $x = e + 4$

| | |
|---|---|
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.6.50 |
| *QUESTION TYPE:* | Numeric Response |
| *HAS VARIABLES:* | True |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.02.05 - Find the domain and range of logarithmic functions. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Numerical Response |
| *NOTES:* | Section 1.6 |
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9. Use the laws of logarithms to expand the expression.

$$\ln\left(\frac{x+1}{x-2}\right)^{\frac{1}{2}}$$

a. $\frac{1}{2}\ln[(x+1)(x-2)]$

b. $\frac{1}{2}\ln(x+1) - \frac{1}{2}\ln(x-2)$

c. $\frac{1}{2}\ln\left(x - \frac{1}{2}\right)$

d. $\frac{1}{2}\ln\left(\frac{x+1}{x-2}\right)$

| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 1.6.39 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.03.06 - Expand logarithmic expressions using the laws of logarithms. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
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10. Use the laws of logarithms to write the expression as the logarithm of a single quantity.

$$4 \ln 5 - \frac{3}{4}\ln(x + 3)$$

a. $\ln \dfrac{625}{(x + 3)^{3/4}}$

b. $\dfrac{4 \ln 5}{\frac{3}{4}\ln(x + 3)}$

c. $\ln 5^4 - \ln(x + 3)^{3/4}$

d. $\dfrac{3 \ln 625}{4(x + 3)}$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.6.40 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.03.07 - Combine logarithmic expressions using the laws of logarithms. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
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**1.5 Logarithms**

11. Simplify the expression.

$e^{3\ln 4}$

a. 7
b. 12
c. 64
d. 81

| | |
|---|---|
| *ANSWER:* | c |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 1.6.38a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.03.05 - Rewrite the logarithm of a power using the laws of logarithms. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
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12. Solve the equation.

$3e^{x+2} = 2$

a. $x = \ln\frac{2}{3} - 2$

b. $x = \ln\frac{2}{3} + 2$

c. $x = \ln\frac{3}{2} - 2$

d. $x = \ln\frac{3}{2} + 2$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Easy |
| *REFERENCES:* | 1.6.51a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.04.04 - Solve exponential equations using logarithms. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
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13. Find a formula for the inverse of the function.

$y = \ln(x + 8)$

a. $y = e^x - 8$

b. $y = e^x + 8$

c. $y = -8e^x$

d. $y = 8e^x$

e. $y = e^{x+8}$

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.6.25 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.01.05.10 - Find the inverse of a function algebraically. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
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**1.5 Logarithms**

14. Find the exact value of the expression.

$\log_5 100 + \log_5 50 - 3\log_5 2$

a. 7
b. 8
c. 6
d. 4
e. 5

| | |
|---|---|
| *ANSWER:* | d |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.6.37a |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.03.02 - Evaluate logarithms using the laws of logarithms. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
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**1.5 Logarithms**

15. If $f(x) = 3x + \ln x$, find $f^{-1}(3)$. Round to the nearest whole.

*ANSWER:* $f^{-1}(3) = 1$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* 1.6.17
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.01.05.09 - Evaluate the inverse of a one-to-one function given its numerical, algebraic, or graphical representation.
*KEYWORDS:* 7ET
*OTHER:* Numerical Response
*NOTES:* Section 1.6
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16. Solve each equation for $x$.

(a) $\ln x = 3$ (b) $e^{e^x} = 6$

*ANSWER:* $x = e^3, x = \ln(\ln 6)$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* 1.6.51
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.UO.03.04.04 - Solve exponential and logarithmic equations algebraically and graphically.
*KEYWORDS:* 7ET
*OTHER:* Numerical Response
*NOTES:* Section 1.6
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**1.5 Logarithms**

17. When a camera flash goes off, the batteries immediately begin to recharge the flash's capacitor, which stores electric charge given by

$$Q(t) = Q_0\left(1 - e^{-t/a}\right)$$

(The maximum charge capacity $Q_0$ is and $t$ is measured in seconds.) How long does it take to recharge the capacitor to 90% of capacity if a = 4?

a. $-4\ln\left(\frac{9}{10}\right)$ seconds

b. $-4\ln\left(\frac{1}{10}\right)$ seconds

c. $-4\ln(10)$ seconds

d. $-4\ln(1)$ seconds

e. $-\ln\left(\frac{4}{9}\right)$ seconds

| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.6.62b |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.10 - Solve applied problems involving exponential functions. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
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**1.5 Logarithms**

18. Suppose that the graph of $y = \log_2 x$ is drawn on a coordinate grid where the unit of measurement is an inch. How many miles to the right of the origin do we have to move before the height of the curve reaches 3 ft? Rounded to the nearest mile.

a. 5.2 mi
b. 1,084,587.7 mi
c. 103 mi
d. 13,015,052.4 mi
e. –97 mi

| | |
|---|---|
| *ANSWER:* | b |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.6.45 |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.04.07 - Solve logarithmic equations using the laws of logarithms. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
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19. If a bacteria population starts with 100 bacteria and doubles every three hours, then the number of bacteria after $t$ hours is

$$n = f(t) = 100\left(2^{\frac{t}{3}}\right).$$

When will the population reach 45,000? Round the answer to the nearest tenth.

a. 26.4 hours
b. 16.4 hours
c. 31.4 hours
d. 21.4 hours
e. 36.4 hours

| | |
|---|---|
| *ANSWER:* | a |
| *POINTS:* | 1 |
| *DIFFICULTY:* | Medium |
| *REFERENCES:* | 1.6.61b |
| *QUESTION TYPE:* | Multi-Mode (Multiple choice) |
| *HAS VARIABLES:* | True |
| *STUDENT ENTRY MODE:* | Basic |
| *LEARNING OBJECTIVES:* | PCALC.COH.LO.03.01.10 - Solve applied problems involving exponential functions. |
| *KEYWORDS:* | 7ET |
| *OTHER:* | Bimodal |
| *NOTES:* | Section 1.6 |
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## 1.6 Sequences and Difference Equations

1. Write the first five terms of the sequence $\{a_n\}$ whose $n^{\text{th}}$ term is given.

$$a_n = \frac{n+9}{5n-1}$$

*ANSWER:* $\frac{5}{2}, \frac{11}{9}, \frac{6}{7}, \frac{13}{19}, \frac{7}{12}$

*POINTS:* 1
*DIFFICULTY:* Easy
*REFERENCES:* 11.1.3
*QUESTION TYPE:* Subjective Short Answer
*HAS VARIABLES:* True
*STUDENT ENTRY MODE:* Basic
*LEARNING OBJECTIVES:* PCALC.COH.LO.10.01.04 - Find the nth term of a sequence.
*OTHER:* Short Answer
*NOTES:* Section 11.1
*DATE CREATED:* 7/20/2015 2:26 PM
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2. Find a formula for the general term $a_n$ of the sequence, assuming that the pattern of the first few terms continues.

$$\left\{-\frac{1}{2}, \frac{8}{3}, -\frac{27}{4}, \frac{64}{5}, -\frac{125}{6}, \ldots\right\}$$

*ANSWER:* $a_n = \frac{(-1)^n n^3}{n+1}$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* 11.1.17
*QUESTION TYPE:* Numeric Response
*HAS VARIABLES:* True
*LEARNING OBJECTIVES:* PCALC.COH.LO.10.01.07 - Write a formula for the nth term of a given sequence.
*OTHER:* Numerical Response
*NOTES:* Section 11.1
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3. Find an expression for the $n^{\text{th}}$ term of the sequence. (Assume that the pattern continues.)

$$\left\{\frac{5}{4}, \frac{10}{9}, \frac{15}{16}, \frac{20}{25}, \frac{25}{36}, \ldots\right\}$$

*ANSWER:* $a_n = \dfrac{5n}{(n+1)^2}$

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* 11.1.13
*QUESTION TYPE:* Subjective Short Answer
*HAS VARIABLES:* True
*STUDENT ENTRY MODE:* Basic
*LEARNING OBJECTIVES:* PCALC.COH.LO.10.01.07 - Write a formula for the nth term of a given sequence.
*OTHER:* Short Answer
*NOTES:* Section 11.1
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4. A sequence $\{a_n\}$ is defined recursively by the equation $a_n = 0.5(a_{n-1} + a_{n-2})$ for $n \geq 3$ where $a_1 = 18$, $a_2 = 18$.

   Use your calculator to guess the limit of the sequence.

   a. 6
   b. 18
   c. 26
   d. 17
   e. 19

   *ANSWER:* b
   *POINTS:* 1
   *DIFFICULTY:* Medium
   *REFERENCES:* 11.2.88
   *QUESTION TYPE:* Multi-Mode (Multiple choice)
   *HAS VARIABLES:* True
   *STUDENT ENTRY MODE:* Basic
   *LEARNING OBJECTIVES:* CALC.COH.LO.07.01.01 - Find the limit of a sequence.
   *OTHER:* Bimodal
   *NOTES:* Section 11.2
   *DATE CREATED:* 7/20/2015 2:26 PM
   *DATE MODIFIED:* 7/10/2020 3:18 PM

5. A sequenceis $\{a_n\}$ defined recursively by the equation $a_n = 0.5(a_{n-1} + a_{n-2})$ for $n \geq 3$ where $a_1 = 20, a_2 = 20$. Use your calculator to guess the limit of the sequence.

   *ANSWER:* 20
   *POINTS:* 1
   *DIFFICULTY:* Medium
   *REFERENCES:* 11.2.88
   *QUESTION TYPE:* Numeric Response
   *HAS VARIABLES:* True
   *OTHER:* Numerical Response
   *NOTES:* Section 11.2
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6. An annuity is a sequence of payments made at regular intervals. Suppose that a sum of \$150 is deposited at the end of each month into an account earning interest at the rate of 12% per year compounded monthly. Then the amount on deposit at the end of the $n^{\text{th}}$ month is $f(n) = 15{,}000[(1.01)^n - 1]$.

   Consider the sequence $\{a_n\}$ defined by $a_n = f(n)$.

   (a) Find the $24^{\text{th}}$ term of the sequence, and interpret your result.

   (b) Evaluate $\lim_{n \to \infty} a_n$, and interpret your result.

*ANSWER:* (a) \$4,046.02 -- This is the amount on deposit after 24 months.
(b) $\infty$ -- The amount on deposit will increase indefinitely as the number of months of deposits increased indefinitely.

*POINTS:* 1
*DIFFICULTY:* Medium
*REFERENCES:* 11.1.65
*QUESTION TYPE:* Subjective Short Answer
*HAS VARIABLES:* True
*STUDENT ENTRY MODE:* Basic
*LEARNING OBJECTIVES:* CALC.COH.LO.07.01.01 - Find the limit of a sequence.
*OTHER:* Short Answer
*NOTES:* Section 11.1
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