Introductory Mathematical Analysis for Business Economics and the Life and Social Sciences (Canadian) 14th edition Haeussler Test Bank

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Introductory Mathematical Analysis, 14e **(Haeussler et al.)**
Chapter 2 Functions and Graphs

2.1 Functions

Provide an appropriate response.

1) Find the domain of the function: $f(t) = \frac{t^2 - t}{4}$

Answer: all real numbers
Type: SA
Objective: (2) Functions

2) Find the domain of the function: $f(t) = \frac{t - 3}{t^2 + t - 2}$

Answer: all real numbers except -2 and 1
Type: SA
Objective: (2) Functions

3) Find the domain of the function: $f(x) = \frac{\sqrt{x - 1}}{x^2 - 9}$

Answer: all real numbers ≥ 1 except 3
Type: SA
Objective: (2) Functions

4) Find the domain of the function: $f(x) = \sqrt{x - 11}$
Answer: all $x \geq 11$
Type: SA
Objective: (2) Functions

5) Find the domain of the function: $f(q) = \sqrt{4 - 3q}$
Answer: all $q \leq \frac{4}{3}$

Type: SA
Objective: (2) Functions

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6) If $f(x) = 5 - 8x$, find:
(a) the domain
(b) $f(1)$
(c) $f(-2)$
(d) $f\left(\frac{5}{8}\right)$
(e) $f(t)$
(f) $f(x + 2)$
Answer:
(a) all real numbers
(b) -3
(c) 21
(d) 0
(e) $5 - 8t$
(f) $-11 - 8x$
Type: SA
Objective: (2) Functions

7) Given the function $f(x) = x^2 + 4x + 2$, find:
(a) the domain
(b) $f(0)$
(c) $f(3)$
(d) $f(-2)$
(e) $f(-t^2)$
Answer:
(a) all real numbers
(b) 2
(c) 23
(d) -2
(e) $t^4 - 4t^2 + 2$
Type: SA
Objective: (2) Functions

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8) If $f(x) = x^2 - 2x + 3$, find:
(a) the domain
(b) $f(2)$
(c) $f(-2)$
(d) $f\left(-\frac{1}{2}\right)$
(e) $f(t^3)$
(f) $f(s + 1)$
(g) $f(x + h)$
Answer:
(a) all real numbers
(b) 3
(c) 11
(d) $\frac{17}{4}$
(e) $t^6 - 2t^3 + 3$
(f) $s^2 + 2$
(g) $x^2 + 2hx + h^2 - 2x - 2h + 3$
Type: SA
Objective: (2) Functions

9) If $g(x) = \frac{x}{x - 4}$, find:
(a) the domain
(b) $g(0)$
(c) $g(-4)$
(d) $g\left(\frac{1}{2}\right)$
(e) $g(x^2)$
Answer:
(a) all real numbers except 4
(b) 0
(c) $\frac{1}{2}$
(d) $-\frac{1}{7}$
(e) $\frac{x^2}{x^2 - 4}$
Type: SA
Objective: (2) Functions

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10) If $g(s) = \frac{3}{s-2} - s$, find:

(a) the domain
(b) $g(0)$
(c) $g(3)$
(d) $g(-4)$
(e) $g\left(\frac{1}{s}\right)$

Answer:
(a) all real numbers except 2
(b) $-\frac{3}{2}$
(c) 0
(d) $\frac{7}{2}$
(e) $\frac{3s}{1-2s} - \frac{1}{s}$

Type: SA
Objective: (2) Functions

11) Given the function $F(t) = \sqrt{t+3}$, find:
(a) the domain
(b) $F(-3)$
(c) $F(13)$
(d) $f(t^2 + 1)$

Answer:
(a) all $t \geq -3$
(b) 0
(c) 4
(d) $\sqrt{t^2+4}$

Type: SA
Objective: (2) Functions

12) If $f(x) = 3x - 1$, find $\frac{f(x+h) - f(x).}{h}$

Answer: 3
Type: SA
Objective: (2) Functions

13) If $f(x) = x^2 + 2x - 6$, find $\frac{f(x+h) - f(x).}{h}$

Answer: $2x + h + 2$
Type: SA
Objective: (2) Functions

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14) If $f(x) = 4 - x^2$, find $\frac{f(x+h)-f(x)}{h}$

Answer: $-2x - h$
Type: SA
Objective: (2) Functions

15) If $f(x) = 4x^2 + 6x$, find $f(3s)$.
Answer: $f(3s) = 36s^2 + 18s$
Type: SA
Objective: (2) Functions

16) If $g(x) = \frac{x+2}{x-5}$, find $g(x - 1)$

Answer: $g(x - 1) = \frac{x+1}{x-6}$

Type: SA
Objective: (2) Functions

17) True or False: If $x + y^2 - 5 = 0$, then x is a function of y.
Answer: True
Type: SA
Objective: (2) Functions

18) For the equation $4y = x^2$, (a) is y a function of x? (b) Is x a function of y?
Answer:
(a) yes (b) no
Type: SA
Objective: (2) Functions

19) The domain of $f(x) = \frac{x^2-3x}{6}$ is

A) all real numbers
B) all real numbers except 6
C) all real numbers except 0
D) all real numbers except 0 and 3
E) all real numbers except 0, 3, and 6
Answer: A
Type: MC
Objective: (2) Functions

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20) The domain of $f(t) = \frac{2}{t-4}$ is

A) all real numbers
B) all real numbers except 0
C) all real numbers except 2
D) all real numbers except 4
E) all real numbers except 2 and 4
Answer: D
Type: MC
Objective: (2) Functions

21) The domain of the function $f(x) = \frac{\sqrt{x+2}}{x^2-16}$ is

A) all real numbers ≥ 2
B) all real numbers ≥ -2
C) all real numbers ≥ -2 except 4
D) all real numbers ≥ 2 except 4
E) all real numbers except 4 and -4
Answer: C
Type: MC
Objective: (2) Functions

22) The domain of $f(q) = \frac{q^2-1}{q^2+4}$ is

A) all real numbers
B) all real numbers except 1 and -1
C) all real numbers except -4
D) all real numbers except -2 and 2
E) all real numbers except -1, 1, and -2
Answer: A
Type: MC
Objective: (2) Functions

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23) The domain of $f(s) = \sqrt{9 - 5s}$ is all real numbers s such that

A) $s \geq \frac{9}{5}$.

B) $s \leq \frac{9}{5}$.

C) $s \geq \frac{5}{9}$.

D) $s \leq \frac{5}{9}$.

E) $s \geq -\frac{5}{9}$.

Answer: B
Type: MC
Objective: (2) Functions

24) The domain of $f(x) = \frac{1}{\sqrt{2x + 3}}$ consists of all real numbers x such that

A) $x \geq \frac{3}{2}$.

B) $x \geq \frac{2}{3}$.

C) $x > \frac{2}{3}$.

D) $x \geq -\frac{3}{2}$.

E) $x > -\frac{3}{2}$.

Answer: E
Type: MC
Objective: (2) Functions

25) If $f(x) = \sqrt{21 - 2x} + x$, then $f(-2) =$

A) 0.
B) $\sqrt{17}$ -2.
C) 3.
D) -7.
E) 7.
Answer: C
Type: MC
Objective: (2) Functions

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26) If $f(x) = (4x^2 + 1)^2$, then $f\left(-\frac{1}{2}\right) =$

A) -1.
B) 0.
C) 2.
D) 3.
E) 4.
Answer: E
Type: MC
Objective: (2) Functions

27) If $g(x) = 2x^2 - 3x + 4$, then $g(0) - g(2) =$
A) 2.
B) -2.
C) 0.
D) -14.
E) 14.
Answer: B
Type: MC
Objective: (2) Functions

28) If $f(x) = -x^2 - 2x - 6$, then $f(2) - f(t) =$
A) $t^2 + 2t - 8$.
B) $-t^2 - 2t + 4$.
C) $t^2 - 2t + 4$.
D) $-t^2 + 6t - 2$.
E) $-4t^2 - 4t + 6$.
Answer: A
Type: MC
Objective: (2) Functions

29) If $f(x) = 2x^2 - 3x + 4$, then $f(x + 1) =$
A) $2x^2 - 3x$.
B) $2x^2 - 3x + 5$.
C) $2x^2 + x + 6$.
D) $2x^2 + x + 3$.
E) $2x^2 + 4x + 7$.
Answer: D
Type: MC
Objective: (2) Functions

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30) If $f(t) = (t + 4)^2$, then $f(t - 3) =$
A) $t^2 + 8t + 19$
B) $t^2 + 8t + 13$.
C) $t^2 + 4t + 13$.
D) $t^2 + 2t + 1$.
E) $t^2 + 1 + 1$.
Answer: D
Type: MC
Objective: (2) Functions

31) If $f(x) = x^2 - 3x + 4$, then $f(2 + h) - f(2) =$
A) $h^2 + h$.
B) $h^2 + h - 4$.
C) h.
D) $h^2 - 3h - 4$.
E) $h^2 - 3h + 4$.
Answer: A
Type: MC
Objective: (2) Functions

32) If $F(t) = (t^2 + 4)^3$, then $F(t^2 + 1) =$
A) $(t^2 + 1)^3$.
B) $(t^2 + 1)^3 + 4$.
C) $(t^2 + 5)^3$.
D) $(t^2 + 5)^3 + 1$.
E) $(t^4 + 2t^2 + 5)^3$.
Answer: E
Type: MC
Objective: (2) Functions

33) If $f(x) = 4x + 5$, then $\frac{f(x + h) - f(x)}{h} =$

A) $\frac{4x + h + 5}{h}$.

B) 0.
C) 1.
D) 4.
E) $4h$.
Answer: D
Type: MC
Objective: (2) Functions

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34) If $f(x) = x^2 + 3x - 8$, then $\frac{f(x+h) - f(x)}{h} =$

A) 0.
B) 1.
C) $2x + h + 3$.
D) $4x + 3h - 2$.
E) $\frac{h^2 + 3h - 8}{h}$.

Answer: C
Type: MC
Objective: (2) Functions

35) Exactly how many of the following equations define y as a function of x?
(a) $y = 7 - x$
(b) $y^2 = 4x$
(c) $y = \sqrt{x}$
(d) $x^2 = y + 4$
A) none
B) one
C) two
D) three
E) all
Answer: D
Type: MC
Objective: (2) Functions

36) Which equation below defines y as a function of x?
A) $\frac{x}{y} = y$
B) $x^2 + y^2 = 9$
C) $y = \pm\sqrt{4 - x^2}$
D) $3x - y^2 = 0$
E) $3y - x^2 = 0$
Answer: E
Type: MC
Objective: (2) Functions

37) Find the domain of the function: $F(x) = \sqrt{2x + 3}$
Answer: $x \geq -\frac{3}{2}$

Type: SA
Objective: (2) Functions

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38) Find the domain of the function: $f(x) = \sqrt{x^2 + x + 1}$
Answer: all real numbers
Type: SA
Objective: (2) Functions

39) Find the domain: $\dfrac{3x + 5}{\sqrt{x^2 + 5}}$
Answer: all real numbers
Type: SA
Objective: (2) Functions

40) Let $g(x) = \sqrt{2x + 3}$, find $\dfrac{g(x + h) - g(x)}{h}$
Answer: $\dfrac{\sqrt{2x + 2h + 3} - \sqrt{2x + 3}}{h}$
Type: SA
Objective: (2) Functions

41) If $f(x) = 1.05x^3 + 7.5x^2 - 1.9$, then find $f(-0.5)$
Answer: -0.15625
Type: SA
Objective: (2) Functions

42) Let $f(t) = t^2 - 1$, find (a) $f(3t)$; (b) $3 \times f(t)$
Answer:
(a) $9t^2 - 1$ (b) $3t^2 - 3$
Type: SA
Objective: (2) Functions

43) Suppose $f(x) = xy^2 + 3xy - y^2$. Find $f(y)$.
Answer: $y^3 + 2y^2$
Type: SA
Objective: (2) Functions

44) In the equation $x^2 + y^2 = 17$; (a) Is x a function of y? (b) Is y a function of x?
Answer:
(a) No (b) No
Type: SA
Objective: (2) Functions

45) In the equation $xy^2 + 2x + 3xy + 7y^2 = 11$, is x a function of y?
Answer: Yes
Type: SA
Objective: (2) Functions

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46) If $f(t) = 1.9x^2 - 3.1x + 2.01$, then find $f(x + 1.1)$.
Answer: $1.9x^2 + 1.08x + .899$
Type: SA
Objective: (2) Functions

47) If $f(x) = \frac{1}{2x + 3}$, then find $\frac{f(x + h) - f(x)}{h}$ and simplify.
Answer: $-\frac{2}{(2x + 2h + 3)(2x + 3)}$
Type: SA
Objective: (2) Functions

48) The perimeter of a square depends on the length of its side.
(a) Write a function $p(l)$ for the perimeter of a square when the length of its side is l.
(b) What is the domain of this function out of context?
(c) What is the domain of this function in the given context?
(d) Find $p(x)$, $p(2x)$ and $p(3x)$.
(e) What happens to the perimeter of a square when the side is scaled by a factor s? Describe using an equation.
Answer:
(a) $p(l) = 4l$
(b) all are real numbers
(c) $l \geq 0$
(d) $4x$; $8x$; $12x$
(e) The perimeter gets scaled by a factor s; $p(sx) = 4sx$
Type: SA
Objective: (2) Functions

49) The elapsed time in seconds since January 1, 2000 at 12:00 A.M. depends on the elapsed hours since January 1, 2000 at 12:00 A.M.
(a) Write a function $e(h)$ for the elapsed seconds since January 1, 2000 at 12:00 A.M. when the elapsed hours are h.
(b) What is the domain of the function out of context?
(c) What is the domain of this function in the given context?
(d) Find $e(t)$, $e(-t)$, $e(100t)$, and $e(-100t)$.
(e) What does multiplying the elapsed hour by -1 mean?
Answer:
(a) $e(h) = 3600h$
(b) all real numbers
(c) all real numbers
(d) $3600t$; $-3600t$; $360{,}000t$; $-360{,}000t$;
(e) The sign changes. Since the function gives the seconds since January 1, 2000 at 12:00 A.M., a positive number represents seconds after that moment, and a negative number represents seconds before that moment.
Type: SA
Objective: (2) Functions

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50) The proceeds from an event depend on the number of people who attend.
(a) Write a function $p(n)$ for the proceeds if each ticket costs \$8.00 and the number of tickets sold is n.
(b) What is the domain of this function out of context?
(c) What is the domain of this function in the given context?
(d) Find $p(c)$, $p(c + 5)$, and $p(c + 25)$.
(e) What happens to the proceeds when the number who attend increases by a constant m? Describe using an equation.
Answer:
(a) $p(n) = 8n$
(b) all real numbers
(c) whole numbers
(d) $8c$; $8c + 40$; $8c + 200$
(e) The proceeds increase by \$$8m$; $p(x + m) = 8x + 8m$
Type: SA
Objective: (2) Functions

51) The weekly salary of an hourly employee depends on the number of hours worked. Employers are required to pay time and a half if an employee works over 40 hours per week. Suppose an employer refuses to pay time and a half and time cards are recorded in half-hour increments.
(a) Write a function $s(h)$ for the weekly salary if a person's hourly pay is \$12.25 and the number of hours worked is h.
(b) What is the domain of this function out of context?
(c) What is the domain of this function in the given context?
(d) Find $s(t)$, $s(t - 5)$, and $s(t - 7)$.
(e) What happens to the salary if the work time decreases by a constant m? Describe using an equation.
Answer:
(a) $s(h) = 12.25h$
(b) all real numbers
(c) {0, 0.5, 1, 1.5, ... 40}
(d) $12.25t$; $12.25t - 61.25$; $12.25t - 85.75$
(e) The salary decreases by $12.25m$; $s(x - m) = 12.25x - 12.25m$
Type: SA
Objective: (2) Functions

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52) The speed you must travel for a given amount of time depends on the distance you must cover.
(a) Write a function $r(d)$ for the speed if the time is 5 hours and the distance covered is d.
(b) What is the domain of this function out of context?
(c) What is the domain of this function in the given context?
(d) Find $r(x)$, $r\left(\frac{x}{2}\right)$ and $r\left(\frac{x}{4}\right)$,.
(e) What happens to the speed if the distance is reduced (divided) by a constant c? Describe using an equation.
Answer:
(a) $r(d) = \frac{d}{5}$
(b) all real numbers
(c) $d \geq 0$
(d) $\frac{x}{5}$; $\frac{x}{10}$; $\frac{x}{20}$
(e) The speed is reduced by a factor of c; $r\left(\frac{x}{c}\right) = \frac{x}{5c}$
Type: SA
Objective: (2) Functions

53) The height of an object thrown in the air depends on the time since it's been thrown. For a particular situation the height in meters of an object after t seconds can be represented by $h(t) = 20t - 4.9t^2$.
(a) What is the domain of this function out of context?
(b) What is the domain of this function in the given context?
(c) Find $h(s)$, $h(s + 2)$, and $h(s + 6)$.
(d) Use an equation to describe what happens to the height if the time increases by a constant d.
Answer:
(a) all real numbers
(b) $t \geq 0$
(c) $-4.9s^2 + 20s$; $-4.9s^2 + 0.4s + 20.4$; $-4.9s^2 - 38.8s - 56.4$
(d) $h(s + d) = -4.9s^2 + (20 - 9.8d)s + 20d - 4.9d^2$
Type: SA
Objective: (2) Functions

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54) The perimeter of a square depends on the length of its side.
(a) Write a function $p(l)$ for the perimeter of a square.
(b) How much linear fencing material is needed to fence a square garden of length x?
(c) If the sides of the square garden are increased by 3 feet, how much more linear fencing material is needed?
(d) How much more linear fencing material is needed per foot increase?
(e) If the sides of the square garden is increased by h, how much more linear fencing material is needed?
(f) How much more linear fencing material is needed per unit increase?
Answer:
(a) $p(l) = 4l$
(b) $4x$ feet
(c) 12 feet
(d) 4 feet
(e) $4h$ units
(f) 4 units
Type: SA
Objective: (2) Functions

55) The area of a circle depends on the length of its radius.
(a) Write a function $a(r)$ for the area of a circle.
(b) How many square units of sod are needed to cover a circular grass area of radius x?
(c) If the radius of the circular grass area is increased by 2 feet, how much more sod is needed?
(d) How much more sod is needed per foot increase?
(e) If the radius of a circular grass area is increased by h, how much more sod is needed?
(f) How much more sod is needed per unit increase?
Answer:
(a) $a(r) = \pi r^2$
(b) πx^2 square feet
(c) $4\pi x + 4\pi$ square feet
(d) $2\pi x + \pi$ square feet
(e) $2\pi xh + \pi h^2$ square units
(f) $\pi x + \pi$ square units
Type: SA
Objective: (2) Functions

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56) The time it takes to go a given distance depends on the rate.
(a) Write a function $t(r)$ for the time it takes if the distance is 400 miles and the rate is r miles per hour.
(b) How much time is needed when the rate is x?
(c) If the speed is increased by 10 miles per hour, how much less time is needed?
(d) How much less time is needed per mile per hour increase?
(e) If the speed is increased by h, how much less time is needed?
(f) How much less time is needed per unit increase?
Answer:
(a) $t(r) = \frac{400}{r}$

(b) $\frac{400}{x}$ hours

(c) $\frac{4000}{x(x+10)}$ hours

(d) $\frac{400}{x(x+1)}$ hours

(e) $\frac{400h}{x(x+h)}$ hours

(f) $\frac{400}{x(x+1)}$ hours

Type: SA
Objective: (2) Functions

57) The height of an object thrown in the air depends on the time since it has been thrown. For a particular situation the height in meters of an object after t seconds can be represented by $h(t) = 20t - 4.9t^2$.
(a) What is the height of the object if the time is x seconds?
(b) If the time is increased by 2 seconds, how much higher is the object?
(c) How much higher is the object per second increase?
(d) If the time is increased by h, how much higher is the object?
(e) How much higher is the object per unit increase?
Answer:
(a) $20x - 4.9x^2$ meters
(b) $-19.6x + 20.4$ meters
(c) $-9.8x + 15.1$ meters
(d) $-9.8hx + 20h - 4.9h^2$ meters
(e) $-9.8x + 15.1$ meters
Type: SA
Objective: (2) Functions

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58) Suppose the weekly demand function for a pound of the house blend coffee at a local coffee shop is $p = 15 - \frac{q}{60}$.

(a) If the current price is $11.25 per pound, how much coffee is sold each week?
(b) If they are selling 180 pounds of coffee each week, what is the current price?
(c) If the owner wants to sell 300 pounds of coffee each week, what should the price be?
Answer:
(a) 225 pounds
(b) $12.00 per pound
(c) $10.00 per pound
Type: SA
Objective: (2) Functions

59) Suppose the yearly demand function for an artist's paintings is $p = \frac{25{,}000}{q}$.

(a) If the current prices is $200.00 per painting, how many paintings are sold each year?
(b) If the artist wants to sell 4 paintings per year, what should the price be?
Answer:
(a) 125 paintings
(b) $6250
Type: SA
Objective: (2) Functions

60) Suppose the weekly supply function for a large pizza at a local pizza parlor is $p = \frac{q}{40}$.

(a) How many large pizzas will be supplied if the price is $12.50 per pizza?
(b) How many large pizzas will be supplied if the price is $18.75 per pizza?
(c) How does the amount supplied change as the price increases?
Answer:
(a) 500 pizzas
(b) 750 pizzas
(c) Amount supplied increases as the price increases.
Type: SA
Objective: (2) Functions

61) Suppose the yearly supply function for a particular actor to star in a film is $p = 150{,}000x$.
(a) How many films per year is the actor willing to produce if he earns $300,000 per film?
(b) How many films per year is the actor willing to produce if he earns $900,000 per film?
(c) How does the amount supplied change as the price increases?
Answer:
(a) 2 films per year
(b) 6 films per year
(c) Amount supplied increases as the price increases.
Type: SA
Objective: (2) Functions

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62) Suppose the yearly supply function for paintings from an artist is $p = 3000x$.
(a) How many paintings per year will be supplied if the price is $21,000 per painting?
(b) How many paintings per year will be supplied if the price is $51,000 per painting?
(c) How does the amount supplied change as the price increases?
Answer:
(a) 7 paintings per year
(b) 17 paintings per year
(c) Amount supplied increases as the price increases.
Type: SA
Objective: (2) Functions

2.2 Special Functions

Provide an appropriate response.

1) Find the domain of the function $f(x) = 6$.
Answer: all real numbers
Type: SA
Objective: (2) Special Functions

2) If $f(x) = 7$, find $f(14)$.
Answer: 7
Type: SA
Objective: (2) Special Functions

3) If $g(x) = |x + 4|$, find $g(-5)$.
Answer: 1
Type: SA
Objective: (2) Special Functions

4) If $f(x) = |1 - 2x| + 2x$, find: (a) $f(1)$ and (b) $f(-1)$.
Answer:
(a) 3 (b) 1
Type: SA
Objective: (2) Special Functions

5) Find: (a) the degree and (b) the leading coefficient of the polynomial function $f(x) = 5x + 7$.
Answer:
(a) 1 (b) 5
Type: SA
Objective: (2) Special Functions

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6) Find: (a) the degree and (b) the leading coefficient of the polynomial function $f(x) = 7 + 5x^2 - x^3$.
Answer:
(a) 3 (b) -1
Type: SA
Objective: (2) Special Functions

7) Find: (a) the degree and (b) the leading coefficient of the polynomial function
$P(x) = -x^5 + 6x^4 - 9x^2 + 7x + 3$
Answer:
(a) 5 (b) -1
Type: SA
Objective: (2) Special Functions

8) Given the function $f(x) = \begin{cases} 3, \text{if } x \geq 2 \\ -3, \text{if } x < 2, \end{cases}$ find:
(a) the domain
(b) $f(0)$
(c) $f(2)$
(d) $f(-2)$
(e) $f(-3)$
Answer:
(a) all real numbers
(b) -3
(c) 3
(d) -3
(e) -3
Type: SA
Objective: (2) Special Functions

9) Given the function $G(x) = \begin{cases} 4, \text{if } x > 0 \\ x + 5, \text{if } x \leq 0, \end{cases}$ find:
(a) the domain
(b) $G(0)$
(c) $G(6)$
(d) $G(-4)$
(e) $G(-10)$
Answer:
(a) all real numbers
(b) 5
(c) 4
(d) 1
(e) -5
Type: SA
Objective: (2) Special Functions

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10) Given the function $f(x) = \begin{cases} 2x, \text{ if } 0 < x < 1 \\ 1 - x, \text{ if } 1 \le x < 2, \\ 0, \text{ if } 2 \le x \le 3 \end{cases}$ find:

(a) the domain
(b) $f(1)$
(c) $f(2)$
(d) $f(3)$
(e) $f(0.1)$
Answer:
(a) $0 < x \le 3$
(b) 0
(c) 0
(d) 0
(e) 0.2
Type: SA
Objective: (2) Special Functions

11) Given the function $F(x) = \begin{cases} 2 + x, \text{ if } x > 3 \\ 5, \text{ if } x = 2, \\ 4 - x, \text{ if } x < 2 \end{cases}$ find:

(a) the domain
(b) $F(2)$
(c) $F(-2)$
(d) $F(5)$
Answer:
(a) $x \le 2 \cup x > 3$
(b) 5
(c) 6
(d) 7
Type: SA
Objective: (2) Special Functions

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12) Given the function $f(x) = \begin{cases} x^2, \text{ if } -1 < x < 0 \\ 2x + 1, \text{ if } 0 \le x < 1, \\ -x, \text{ if } 1 \le x < 2 \end{cases}$ find:

(a) the domain
(b) $f(0)$
(c) $f(1)$
(d) $f\left(-\frac{1}{2}\right)$
(e) $f\left(\frac{1}{2}\right)$
(f) $f\left(\frac{3}{2}\right)$

Answer:
(a) $-1 < x < 2$
(b) 1
(c) -1
(d) $\frac{1}{4}$
(e) 2
(f) $-\frac{3}{2}$

Type: SA
Objective: (2) Special Functions

13) Under certain conditions, if two brown-eyed parents have exactly four children, the probability P that exactly r of them are blue-eyed is a function of r and is given by $P(r) = \frac{4!\left(\frac{1}{4}\right)^r\left(\frac{3}{4}\right)^{4-r}}{r!(4-r)!}$.

Find the probability that exactly thee children will be blue-eyed.

Answer: $\frac{3}{64}$

Type: SA
Objective: (2) Special Functions

14) Under certain conditions, if two brown-eyed parents have exactly four children, the probability P that exactly r of them are blue-eyed is a function of r and is given by $P(r) = \frac{4!\left(\frac{1}{4}\right)^r\left(\frac{3}{4}\right)^{4-r}}{r!(4-r)!}$.

Find the probability that exactly one child will be blue-eyed.

Answer: $\frac{27}{64}$

Type: SA
Objective: (2) Special Functions

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15) The response R to a shock of intensity I is a number estimated by $R = f(I) = \frac{I^2}{1000}$.

(a) Express $f(2I_0)$ in terms of $f(I_0)$.

(b) What effect does the doubling of intensity have on response?

Answer:

(a) $4f(I_0)$

(b) It quadruples response.

Type: SA

Objective: (2) Special Functions

16) For the polynomial function $f(x) = 4x^3 + 2x^6$,

Find: (a) the degree, and (b) the leading coefficient

Answer:

(a) 6; (b) 2

Type: SA

Objective: (2) Special Functions

17) For the polynomial function $f(x) = 4 - 6x - 5x^3$,

Find: (a) the degree, and (b) the leading coefficient

Answer:

(a) 3; (b) -5

Type: SA

Objective: (2) Special Functions

18) If $f(x) = \begin{cases} x^2, & \text{if } x < 0 \\ 4x, & \text{if } 0 \le x \le 1 \\ x, & \text{if } x > 1 \end{cases}$, find

(a) $f(-2)$

(b) $f(0)$

(c) $f\left(\frac{1}{4}\right)$

(d) $f(1)$

(e) $f(5)$

Answer:

(a) 4

(b) 0

(c) 1

(d) 4

(e) 5

Type: SA

Objective: (2) Special Functions

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19) If $g(x) = \begin{cases} x^2 - 2x + 1, & \text{if } x < 0 \\ 2 - 3x, & \text{if } x \geq 0 \end{cases}$,

(a) $g(-3)$

(b) $g(0)$

(c) $g(4)$

Answer:

(a) 16

(b) 2

(c) -10

Type: SA

Objective: (2) Special Functions

20) Is $3x^{-2} + x^{-1} + 5 + 6x + 11x^2$ a polynomial function or a rational function? Why?

Answer: Rational function, since it has negative exponents.

Type: SA

Objective: (2) Special Functions

21) If $f(x) = \begin{cases} 3 - x, \text{ if } 2 \leq x \leq 5 \\ 1 - 2x, \text{ if } 0 \leq x < 2 \\ 7 + x^2, \text{ if } -3 \leq x < 0 \end{cases}$,

(a) find the domain of $f(x)$

(b) find $f(3)$

Answer:

(a) $-3 \leq x \leq 5$ (b) 0

Type: SA

Objective: (2) Special Functions

22) If $g(x) = \begin{cases} x^2 - 1, \text{ if } -1 \leq x \leq 2 \\ 2x - 3, \text{ if } -3 \leq x < -1 \\ x^2 + 1, \text{ if } -5 \leq x < -3 \end{cases}$

(a) find the domain of $f(x)$

(b) find $f(2) + f(-2)$

Answer:

(a) $-5 \leq x \leq 2$ (b) -4

Type: SA

Objective: (2) Special Functions

23) Determine: (a) 5!; (b) $\frac{5!}{3!2!}$

Answer:

(a) 120 (b) 10

Type: SA

Objective: (2) Special Functions

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24) Let $f(x) = |2x - 3|$. Find $f(4) - f(-4)$
Answer: -6
Type: SA
Objective: (2) Special Functions

25) $f(x) = \begin{cases} .01x^2 - 3.12 \text{ if } x \geq 6.3 \\ .39x - 1.2 \text{ if } x < 6.3 \end{cases}$

Find: (a) $f(6.3)$; (b) $f(0)$
Answer:
(a) -2.7231 (b) -1.2
Type: SA
Objective: (2) Special Functions

26) Ellen's health plan has a $5.00 copayment for complete pregnancy care.
(a) Write the cost of her prenatal care as a function of the number of prenatal visits she makes.
(b) How does Ellen's cost change as her number of prenatal visits increases?
(c) What kind of function is this?
Answer:
(a) $p(n) = 5$
(b) Her cost does not change.
(c) constant function
Type: SA
Objective: (2) Special Functions

27) A train holds 200 passengers and departs daily at 8:00 A.M.
(a) Write the daily departure time as a function of the number of people on the train.
(b) How does the departure time change as the number of people on the train increases?
(c) What kind of function is this?
Answer:
(a) $t(n) = 8:00$
(b) The departure times does not change.
(c) constant function
Type: SA
Objective: (2) Special Functions

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28) A coffee shop earns $8.75 for every pound of coffee it sells.
(a) Write the profit as a function of the number of pounds of coffee sold.
(b) What kind of function is this?
(c) What is its degree?
(d) What is its leading coefficient?
Answer:
(a) $p(n) = 8.75n$
(b) linear function
(c) 1
(d) 8.75
Type: SA
Objective: (2) Special Functions

29) The height of an object thrown in the air depends on the time since it has been thrown. For a particular situation the height in meters of an object after t seconds can be represented by $h(t) = 32t - 4.9t^2$.
(a) What kind of function is this?
(b) What is its degree?
(c) What is its leading coefficient?
Answer:
(a) quadratic function
(b) 2
(c) -4.9
Type: SA
Objective: (2) Special Functions

30) A rectangular sheet of metal has a length that is 4 more than the width.
(a) Write the area of the rectangular sheet as a function of the width.
(b) Without simplifying, write the ratio of the length of the sheet to the area of the sheet as a function of the width.
(c) Simplify the function you wrote in b.
(d) What kind of function is this?
(e) What is its domain out of context?
(f) What is its domain in the given context?
Answer:
(a) $a(w) = w(w + 4)$
(b) $f(w) = \frac{w + 4}{w(w + 4)}$
(c) $f(w) = \frac{1}{w}$
(d) rational function
(e) all real numbers except 0 and -4
(f) $w > 0$
Type: SA
Objective: (2) Special Functions

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31) A rectangular sheet of metal has a length that is 2 less than 4 times the width.
(a) Write the area of the rectangular sheet as a function of the width.
(b) Without simplifying, write the ratio of the length of the sheet to the area of the sheet as a function of the width.
(c) Simplify the function you wrote in b.
(d) What kind of function is this?
(e) What is its domain out of context?
(f) What is its domain in the given context?
Answer:
(a) $a(w) = w(4w - 2)$
(b) $f(w) = \frac{4w - 2}{w(4w - 2)}$
(c) $f(w) = \frac{1}{w}$
(d) rational function
(e) all real numbers except 0 and $\frac{1}{2}$
(f) $w > \frac{1}{2}$
Type: SA
Objective: (2) Special Functions

32) A cylinder has a height that is 4 more than the diameter of its base.
(a) Write the area of its circular base as a function of its radius.
(b) Write the volume of the cylinder as a function of its radius.
(c) Without simplifying, write the ratio of the area of the circular base and the volume of the cylinder as a function of the radius.
(d) Simplify the function you wrote in c.
(e) What kind of function is this?
(f) What is its domain out of context?
(g) What is its domain in the given context?
Answer:
(a) $a(r) = \pi r^2$
(b) $v(r) = (2r + 4)(\pi r^2)$
(c) $f(r) = \frac{\pi r^2}{(2r + 4)(\pi r^2)}$
(d) $\frac{1}{2r + 4}$
(e) rational function
(f) all real numbers except -2 and 0
(g) $r > 0$
Type: SA
Objective: (2) Special Functions

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33) A cylinder has a height that is 3 times as long as the radius.
(a) Write the area of its circular base as a function of its radius.
(b) Write the volume of the cylinder as a function of its radius.
(c) Without simplifying, write the ratio of the area of the circular base and the volume of the cylinder as a function of the radius.
(d) Simplify the function you wrote in c.
(e) What kind of function is this?
(f) What is its domain out of context?
(g) What is its domain in the given context?
Answer:
(a) $a(r) = \pi r^2$
(b) $v(r) = 3r\ (\pi r^2)$
(c) $f(r) = \dfrac{\pi r^2}{3r(\pi r^2)}$
(d) $\dfrac{1}{3r}$
(e) rational function
(f) all real numbers except 0
(g) $r > 0$
Type: SA
Objective: (2) Special Functions

34) To encourage conservation, a gas company charges two rates. You pay \$0.53 per therm for 0-70 therms and \$0.74 for each therm over 70. Write a compound fraction to represent the monthly cost of t therms of water.
Answer: $c(t) = \begin{cases} 0.53t & \text{if } t \le 70 \\ 0.74\ (t - 70) + 37.1 & \text{if } t > 70 \end{cases}$ which simplifies to $c(t) = \begin{cases} 0.53t & \text{if } t \le 70 \\ 0.74t - 14.7 & \text{if } t > 70 \end{cases}$
Type: SA
Objective: (2) Special Functions

35) To encourage an even flow of customers, a restaurant varies the price of an item throughout the day. From 6:00 P.M. to 8:00 P.M. customers pay full price. At lunch from 10:30 A.M. until 2:30 P.M. customers pay half price. From 2:30 until 4:30 customers get a dollar off the lunch price. From 4:30 P.M. until 6:00 P.M. customers get \$5.00 off the dinner price. From 8:00 until closing time at 10:00 customers get \$5.00 off the dinner price. Write a compound function to represent the cost of an item throughout the day for a dinner price of d.
Answer: $c(t) = \begin{cases} d/2 & 10{:}30 \text{ A.M.} \le t < 2{:}30 \text{ P.M.} \\ d/2 - 1 & 2{:}30 \text{ P.M.} \le t < 4{:}30 \text{ P.M.} \\ d - 5 & 4{:}30 \text{ P.M.} \le t < 6{:}00 \text{ P.M.} \\ d & 6{:}00 \text{ P.M.} \le t < 8{:}00 \text{ P.M.} \\ d - 5 & 8{:}00 \text{ P.M.} \le t < 10{:}00 \text{ P.M.} \end{cases}$
Type: SA
Objective: (2) Special Functions

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36) Brett rented a bike from a rental shop and rode at a constant rate of 12 mph for 2.5 hours along a bike path, and then returned along the same path at the same rate. Write an absolute-value function to represent Brett's distance from the rental shop as a function of time.
Answer: $f(x) = -|12(x - 2.5)| + 30$
Type: SA
Objective: (2) Special Functions

37) Julie lives 32 miles from the city. She drove home from the city at a constant rate of 60 mph along the highway. At the exit 2 miles from her home, she realized she had left her purse at the department store. She immediately returned to the department store at a rate of 60 mph. Write an absolute-value function to represent Julie's distance from home as she drove home from the city.
Answer: $f(x) = |60(x - 0.5)| + 2$
Type: SA
Objective: (2) Special Functions

38) In June Gail decided to save $20.00 a week. She saved for 14 weeks and then for 14 weeks she spent $20.00 a week on gifts. Write an absolute-value function to represent the amount of money Gail had in savings.
Answer: $f(x) = -|20(x - 14)| + 280$
Type: SA
Objective: (2) Special Functions

39) In November, Steve uses his credit cards to buy $30.00 of holiday gifts each week. After 8 weeks he begins saving $30.00 each week to pay his credit card bill. Write an absolute-value function to represent the amount Steve has saved since he started buying holiday gifts. (Hint: Let purchases on credit cards represent negative savings.)
Answer: $f(x) = |30(x - 8)| - 240$
Type: SA
Objective: (2) Special Functions

40) Suppose a committee of 6 people is to be selected from a group of 25. How many groups are possible? Represent as a factorial and give the solution.
Answer: $\frac{25!}{6!19!} = 177{,}100$

Type: SA
Objective: (2) Special Functions

41) You want to play a lottery that uses 50 numbers. How many combinations are possible if you need to pick 5 numbers? Represent as a factorial and give the solution.
Answer: $\frac{50!}{5!45!} = 2{,}118{,}760$

Type: SA
Objective: (2) Special Functions

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2.3 Combinations of Functions

Provide an appropriate response.

1) If f(x) = x^2 and $g(x) = 2x + 1$, find:
(a) $(f + g)(x)$
(b) $(f + g)(3)$
(c) $(f - g)(x)$
(d) $(fg)(x)$
(e) $(fg)\left(-\frac{1}{2}\right)$
(f) $\left(\frac{f}{g}\right)(t^2)$
(g) $f(g(x))$
(h) $f(g(1))$
(i) $g(f(x))$
Answer:
(a) $x^2 + 2x + 1$
(b) 16
(c) $x^2 - 2x - 1$
(d) $2x^3 + x^2$
(e) 0
(f) $\frac{t^4}{2t^2 + 1}$
(g) $4x^2 + 4x + 1$
(h) 9
(i) $2x^2 + 1$
Type: SA
Objective: (2) Combinations of Functions

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2) If $f(x) = 2x + 3$ and $g(x) = x^2 - 4x - 2$, find:
(a) $(f + g)(x)$
(b) $(f - g)(x)$
(c) $(fg)(x)$
(d) $\left(\frac{f}{g}\right)(x)$
(e) $f(g(x))$
(f) $g(f(x))$
(g) $f(g(1))$
(h) $g(f(1))$
Answer:
(a) $x^2 - 2x + 1$
(b) $6x + 5 - x^2$
(c) $2x^3 - 5x^2 - 16x - 6$
(d) $\frac{2x + 3}{x^2 - 4x - 2}$
(e) $2x^2 - 8x - 1$
(f) $4x^2 + 4x - 5$
(g) -7
(h) 3
Type: SA
Objective: (2) Combinations of Functions

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3) If $f(x) = 5 - x$ and $g(x) = 2x^2 - 3x + 4$, find:
(a) $(f + g)(x)$
(b) $(f - g)(x)$
(c) $(f - g)(2)$
(d) $(fg)(x)$
(e) $(fg)(0)$
(f) $\left(\frac{f}{g}\right)(x)$
(g) $f(g(x))$
(h) $g(f(x))$
(i) $g(f(1))$
Answer:
(a) $2x^2 - 4x + 9$
(b) $-2x^2 + 2x + 1$
(c) -3
(d) $-2x^3 + 13x^2 - 19x + 20$
(e) 20
(f) $\frac{5 - x}{2x^2 - 3x + 4}$
(g) $1 - 2x^2 + 3x$
(h) $2x^2 - 17x + 39$
(i) 24
Type: SA
Objective: (2) Combinations of Functions

4) Let $f(x) = x^2 + 3x + 1$ and $g(x) = -2$.
(a) Find: $(f \circ g)(x)$
(b) Find: $(g \circ f)(x)$
Answer:
(a) -1 (b) -2
Type: SA
Objective: (2) Combinations of Functions

5) If $f(x) = 2x + 3$ and $g(x) = 3x - 2$, find:
(a) $(f \circ g)(x)$
(b) $(g \circ f)(x)$
Answer:
(a) $6x - 1$ (b) $6x + 7$
Type: SA
Objective: (2) Combinations of Functions

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6) If $f(x) = 3 - 2x$ and $g(x) = x^2 + 7$, find:
(a) $(f \circ g)(x)$
(b) $(g \circ f)(x)$
Answer:
(a) $-11 - 2x^2$ (b) $16 - 12x + 4x^2$
Type: SA
Objective: (2) Combinations of Functions

7) If $f(x) = 2x^2 + 1$ and $g(x) = x - 1$, find $(f \circ g)(x) - (g \circ f)(x)$
Answer: $-4x + 3$
Type: SA
Objective: (2) Combinations of Functions

8) If $f(x) = \sqrt{x + 4}$ and $g(x) = x^3 + 5$, find: (a) $f(g(x))$ and (b) $g(f(x))$.
Answer:
(a) $\sqrt{x^3 + 9}$ (b) $\left(\sqrt{x + 4}\right)^3 + 5$
Type: SA
Objective: (2) Combinations of Functions

9) If $f(x) = \frac{1}{x + 1}$ and $g(x) = x + 1$, find: (a) $f(g(x))$ and (b) $g(f(x))$.

Answer:
(a) $\frac{1}{x + 2}$ (b) $\frac{1}{x + 1} + 1 = \frac{x + 2}{x + 1}$
Type: SA
Objective: (2) Combinations of Functions

10) If $(f(x) = 3 - 2x$, find $f(f(x))$.
Answer: $4x - 3$
Type: SA
Objective: (2) Combinations of Functions

11) If $h(x) = (2x - 3)^5$, find functions f and g such that $h(x) = f(g(x))$.
Answer: $f(x) = x^5$, $g(x) = 2x - 3$ (Other answers are possible.)
Type: SA
Objective: (2) Combinations of Functions

12) If $h(x) = \frac{x^2}{x^2 + 1}$, find functions f and g such that $h(x) = f(g(x))$.

Answer: $f(x) = \frac{x}{x + 1}$, $g(x) = x^2$. (Other answers are possible.)

Type: SA
Objective: (2) Combinations of Functions

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13) If $h(x) = \sqrt[3]{x + 4}$, find functions f and g such that $h(x) = f(g(x))$.
Answer: $f(x) = \sqrt[3]{x}$, $g(x) = x + 4$ (Other answers are possible.)
Type: SA
Objective: (2) Combinations of Functions

14) If $f(x) = \sqrt{x - 3}$ and $g(x) = x^2 - 7$, then $f(g(7)) =$
A) 81.
B) $\sqrt{42}$.
C) $\sqrt{39}$.
D) 84.
E) -3.
Answer: C
Type: MC
Objective: (2) Combinations of Functions

15) If $f(x) = x^2 + 1$ and $g(x) = x^3$, then $(f \circ g)(x) =$
A) $x^5 + 1$.
B) x^6.
C) $x^6 + 1$.
D) $(x^2 + 1)^3$.
E) $(x^2 + 1)^3 + 1$.
Answer: C
Type: MC
Objective: (2) Combinations of Functions

16) If $f(x) = 4x - 5$ and $g(x) = x^2 + 3x - 1$, then $f(g(x)) =$
A) $x^2 + 4x + 5$.
B) $x^2 + 7x - 6$.
C) $4x^3 + 7x^2 - 19x + 5$.
D) $4x^2 + 12x - 9$.
E) $16x^2 - 28x + 9$.
Answer: D
Type: MC
Objective: (2) Combinations of Functions

17) If $f(x) = \sqrt{x + 5}$ and $g(x) = x^2 - 3x - 5$, then the value of $(f \circ g)(4)$ is
A) 2.
B) $2\sqrt{3}$.
C) 5.
D) -3.
E) -4.
Answer: A
Type: MC
Objective: (2) Combinations of Functions

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18) If $f(x) = 4 - 3x$, then $(f \circ f)(x) =$
A) $8 - 6x$.
B) $6x - 8$.
C) $9x - 8$.
D) $16 - 9x^2$.
E) $16 - 24x + 9x^2$.
Answer: C
Type: MC
Objective: (2) Combinations of Functions

19) If $f(x) = \frac{x+1}{x-7}$ and $g(x) = 2x^3$, find $(f(g(x))$.

Answer: $(f(g(x)) = \frac{2x^3+1}{2x^3-7}$

Type: SA
Objective: (2) Combinations of Functions

20) If $f(x) = 2x - 1$ and $g(x) = 4x + 8$, then $g(f(x)) =$
A) $16x - 8$.
B) $16x + 7$.
C) $16x^2 + 12x - 8$.
D) $8x + 4$.
E) $8x + 15$.
Answer: D
Type: MC
Objective: (2) Combinations of Functions

21) If $f(x) = \sqrt{x+1}$ and $g(x) = 3x^2 + 4$, find $f(g(x))$.
Answer: $f(g(x)) = \sqrt{3x^2+5}$
Type: SA
Objective: (2) Combinations of Functions

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22) Let $f(x) = \begin{cases} x^2 + 2x & \text{if } 0 \le x \le 5 \\ 3x - 2 & \text{if } -3 \le x < 0 \end{cases}$; $g(x) = 1 - 4x$.

Find:
(a) $f(0)$
(b) $f(-1)$
(c) $f(4) - f(-2)$
(d) $f(g(0))$
(e) $g(f(0))$
Answer:
(a) 0
(b) -5
(c) 32
(d) 3
(e) 1
Type: SA
Objective: (2) Combinations of Functions

23) Let $g(x) = 1 - 4x$, $h(x) = x^2 + 3x$. Find: (a) $(g \circ h)(x)$; (b) $(h \circ g)(x)$
Answer:
(a) $1 - 4x^2 - 12x$ (b) $16x^2 - 20x + 4$
Type: SA
Objective: (2) Combinations of Functions

24) $h(x) = x^3 - 7x^2 + 1$; $g(x) = x^2 + 2x$. Find
(a) $(h + g)(.1)$
(b) $(h - g)(.1)$
(c) $(hg)(.1)$
(d) $\left(\frac{h}{g}\right)(.1)$
Answer:
(a) 1.141
(b) 0.721
(c) 0.19551
(d) 4.433
Type: SA
Objective: (2) Combinations of Functions

25) Let $h(x) = \sqrt{7 - x}$. Find functions f and g such that $h = f \circ g$.
Answer: $f(x) = \sqrt{x}$; $g(x) = 7 - x$
Type: SA
Objective: (2) Combinations of Functions

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26) Let $h(x) = 3(x - 1)^3 + 7(x - 1)^2 + 8(x - 1) + 11$. Find functions f and g such that $h = f \circ g$.
Answer: $f(x) = 3x^3 + 7x^2 + 8x + 11$; $g(x) = x - 1$
Type: SA
Objective: (2) Combinations of Functions

27) $f(x) = \begin{cases} x - 2 & \text{if } x \geq 0 \\ 2x + 1 & \text{if } x < 0 \end{cases}$; $g(x) = x^2 - 4$.
Find:
(a) $(f \circ g)(-1)$
(b) $(g \circ f)(-1)$
(c) $(f \circ g)(2)$
(d) $(g \circ f)(2)$
Answer:
(a) -5
(b) -3
(c) -2
(d) -4
Type: SA
Objective: (2) Combinations of Functions

28) Traci earns $15.00 per hour and Rich earns $18.00 per hour.
(a) Write a function $t(x)$ for Traci's earnings as a function of hours worked.
(b) Write a function $r(x)$ for Rich's earnings as a function of hours worked.
(c) Assuming they work the same number of hours each week, write a function $(t + r)(x)$ for their combined earnings as a function of hours worked.
Answer:
(a) $t(x) = 15x$
(b) $r(x) = 18x$
(c) $(t + r)(x) = 33x$
Type: SA
Objective: (2) Combinations of Functions

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29) Suppose an artist always paints rectangular pictures using a square of unknown length as a reference. She always makes the length 4 units longer than the square, and the width is 2 units longer than the square.
(a) Write a function $l(x)$ for the length of a painting as a function of the length of the square.
(b) Write a function $a(x)$ for the area of a painting as a function of the length of the square.
(c) Write a function $\left[\frac{l}{a}\right](x)$ for the ratio of the length to the area as a function of the length of the square.
Answer:
(a) $l(x) = x + 4$
(b) $a(x) = (x + 4)(x + 2)$
(c) $\left[\frac{l}{a}\right](x) = \frac{1}{x+2}$
Type: SA
Objective: (2) Combinations of Functions

30) A shirt costs x wholesale. The price the store pays is given by the function $s(x) = \frac{3}{2}x + 5$, where x is the wholesale price. The price the customer pays is $c(x) = 2(x + 1)$ where x is the price the store pays. Write a composite function to find the customer's price as a function of the wholesale price.
Answer: $c(s(x)) = 3x + 12$
Type: SA
Objective: (2) Combinations of Functions

31) A coat costs x wholesale. The price the store pays is given by the function $s(x) = 1.2x$ where x is the wholesale price. The price the customer pays is $c(x) = 2x + 50$ where x is the price the store pays. Write a composite function to find the customer's price as a function of the wholesale price.
Answer: $c(s(x)) = 2.4x + 50$
Type: SA
Objective: (2) Combinations of Functions

32) A car costs x wholesale. The price the dealer pays is given by the function $s(x) = x + 500$, where x is the wholesale price. The price the customer pays is $c(x) = x + 1500$ where x is the price the dealer pays. Write a composite function to find the customer's price as a function of the wholesale price.
Answer: $c(s(x)) = x + 2000$
Type: SA
Objective: (2) Combinations of Functions

33) Suppose the area of a square tablecloth is $t(x) = (x + 6)^2$. Express as a composition of two functions and explain what each function represents.
Answer: Let the length of a side be represented by the function $l(x) = x + 6$ and the area of a square with sides of length x be represented by $a(x) = x^2$. Then $t(x) = (x + 6)^2 = [l(x)]^2 = a(l(x))$.
Type: SA
Objective: (2) Combinations of Functions

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34) Suppose the volume of a cube is $v(x) = (x - 4)^3$. Express as a composition of two functions and explain what each function represents.
Answer: Let the length of a side of the cube be represented by the function $l(x) = x - 4$ and the volume of a cube with sides of length x be represented by the function $f(x) = x^3$. Then $v(x) = (x - 4)^3 = [l(x)]^3 = f(l(x))$.
Type: SA
Objective: (2) Combinations of Functions

2.4 Inverse Functions

Provide an appropriate response.

1) Find the inverse of the function: f(x) = 8x + 3
Answer: $f^{-1}(x) = \frac{1}{8}(x - 3)$

Type: SA
Objective: (2) Inverse Functions

2) Find the inverse of the function: $f(x) = (x - 3)^2$, for $x \geq 3$
Answer: $f^{-1}(x) = \sqrt{x} + 3$
Type: SA
Objective: (2) Inverse Functions

3) Determine whether or not the function is one-to-one: f(x) = 7x + 6
Answer: The function is one-to-one.
Type: SA
Objective: (2) Inverse Functions

4) Determine whether or not the function is one-to-one: $f(x) = x^2 - 3$
Answer: The function is not one-to-one.
Type: SA
Objective: (2) Inverse Functions

5) Determine whether or not the function is one-to-one: $f(x) = (x + 2)^3 - 8$.
Answer: The function is one-to-one.
Type: SA
Objective: (2) Inverse Functions

6) Determine whether or not the function is one-to-one: f(x) = |x - 8|.
Answer: The function is not one-to-one.
Type: SA
Objective: (2) Inverse Functions

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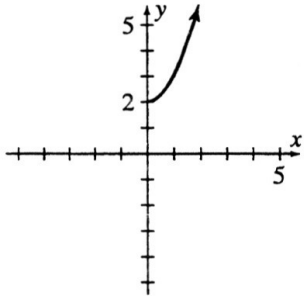
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7) Let $p = 500 - \frac{1}{2}q$ represent a demand equation for a product where p is unit price and q is quantity with the restriction $0 \leq q < 1000$. Express the quantity q as a function of p.
Answer: $q = -2p + 1000$
Type: SA
Objective: (2) Inverse Functions

2.5 Graphs in Rectangular Coordinates

Provide an appropriate response.

1) The graph of $y = f(x)$ is shown below. (a) What is the domain of f? (b) What is the range of f?

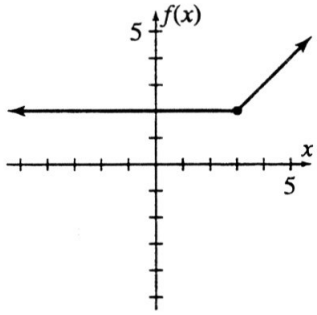


Answer:
(a) all nonnegative real numbers
(b) all real numbers greater than or equal to 2
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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2) The graph of $y = f(x)$ is shown below. Estimate:
(a) $f(-1)$
(b) $f(0)$
(c) $f(2)$
(d) $f(3)$
(e) What is the domain of f?
(f) What is the range of f?



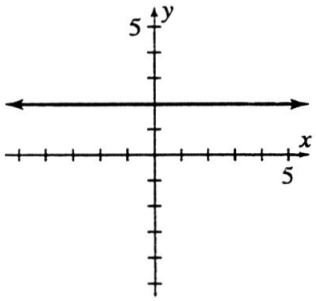
Answer:
(a) 2
(b) 2
(c) 2
(d) 2
(e) all real numbers
(f) all real numbers greater than or equal to 2
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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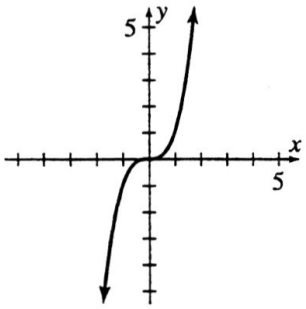
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3) Which graphs below represent functions of x?

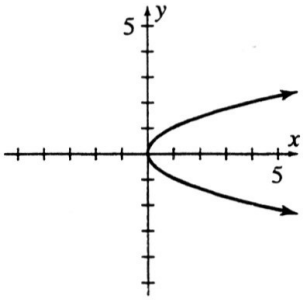
(a)



(b)



(c)



Answer: (a) and (b)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

4) Determine the x- and y-intercepts of the graph of $y = x^2 + x - 12$.
Answer: (3, 0), (-4, 0); (0, -12)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

5) Determine the x- and y-intercepts of the graph of $y = x^3 - 4x$.
Answer: (0, 0), (± 2, 0); (0, 0)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

6) Determine the x- and y-intercepts of the graph of $y = \dfrac{7 - 14x}{(x + 2)(x - 1)}$.

Answer: $\left(\frac{1}{2}, 0\right); \left(0, -\frac{7}{2}\right)$
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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7) Determine the x- and y-intercepts of the graph of $y = \dfrac{4}{x^2 - 3x + 2}$.

Answer: no x-intercept; (0, 2)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

8) Determine the x- and y-intercepts of the graph of $\dfrac{x^2}{25} + \dfrac{y^2}{64} = 1$.

Answer: $(\pm 5, 0)$; $(0, \pm 8)$
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

9) Determine the x- and y-intercepts of the graph of $y = e^x(x + 3)$.
Answer: (-3, 0); (0, 3)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

10) Determine the x- and y-intercepts of the graph of $y = x^4 - 16$.
Answer: $(\pm 2, 0)$; (0, -16)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

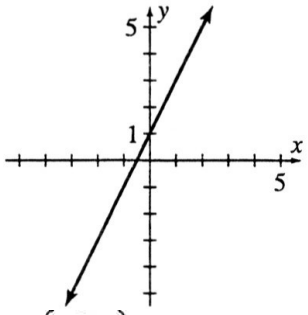
11) Determine the x- and y-intercepts of the graph of $y = \dfrac{x^2 - 3x - 10}{x^2 + 2x + 1}$

Answer: (-2, 0), (5, 0); (0, -10)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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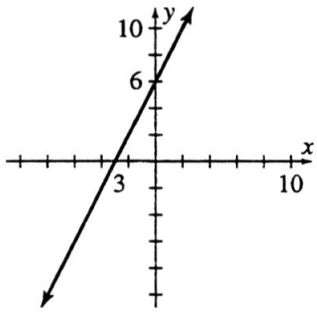
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12) (a) Sketch the graph of $y = 2x + 1$. (b) Determine the intercepts.
(c) Based on your graph, is y a function of x? If so, state
(d) the domain and (e) the range.
Answer:
(a)



(b) $\left(-\frac{1}{2}, 0\right)$, (0,1)
(c) y is a function of x
(d) all real numbers
(e) all real numbers
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

13) (a) Sketch the graph of $y = f(x) = 2x + 6$. (b) Determine the intercepts. State (c) the domain and (d) the range of f.
Answer:
(a)

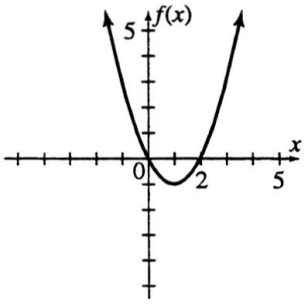


(b) (-3, 0), (0, 6)
(c) all real numbers
(d) all real numbers
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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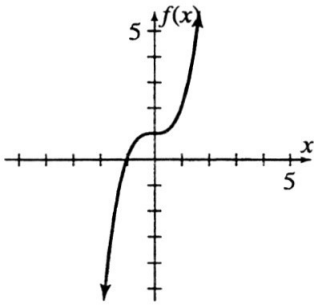
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14) Sketch the graph of $f(x) = x^2 - 2x$. Also determine the intercepts.
Answer:



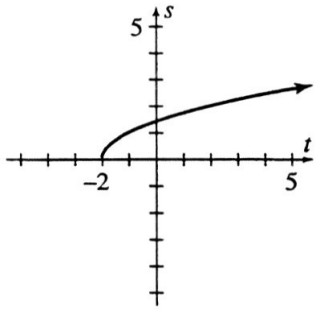
Intercepts: (2, 0), (0, 0)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

15) Sketch the graph of $f(x) = x^3 + 1$. Also determine the intercepts.
Answer:



Intercepts: (-1, 0), (0, 1)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

16) Sketch the graph of $s = f(t) = \sqrt{t+2}$. Also determine the intercepts.
Answer:



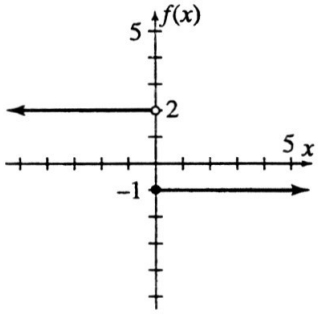
Intercepts: (-2, 0), $(0,\sqrt{2})$
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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17) Sketch the graph of $f(x) = \begin{cases} -1, \text{if } x \geq 0 \\ 2, \text{if } x < 0 \end{cases}$, and give the domain and range.

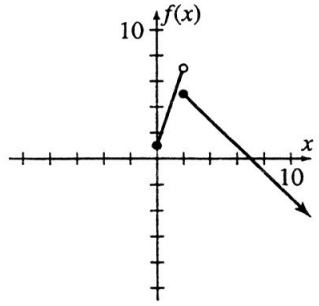
Answer:



Domain: all real numbers
Range: $\{-1, 2\}$
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

18) Sketch the graph of $f(x) = \begin{cases} 3x + 1, \text{if } 0 \leq x < 2 \\ 7 - x, \text{if } x \geq 2 \end{cases}$, and give the domain and range.

Answer:

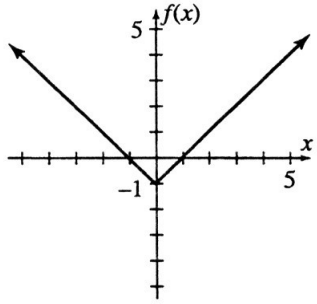


Domain: all nonnegative reals
Range: all reals < 7
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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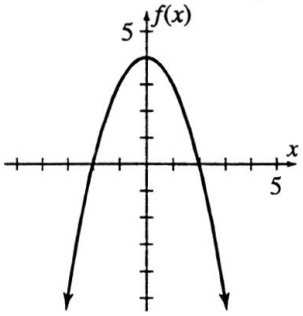
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19) The domain and range of the function *f* whose graph appears below is



A) Domain: all real numbers
Range: all real numbers
B) Domain: all real numbers
Range: all real numbers greater than or equal to -1
C) Domain: all real numbers greater than or equal to -1
Range: all real numbers
D) Domain: all real numbers
Range: all nonnegative real numbers
E) Domain: all nonnegative real numbers
Range: all real numbers less than or equal to -1
Answer: B
Type: MC
Objective: (2) Graphs in Rectangular Coordinates

20) The domain and range of the function *f* whose graph appears below is



A) Domain: all real numbers
Range: all real numbers
B) Domain: all real numbers
Range: all real numbers less than or equal to 4
C) Domain: all real numbers less than or equal to 4
Range: all real numbers
D) Domain: all real numbers less than or equal to 4
Range: all nonnegative real numbers
E) Domain: all nonnegative real numbers
Range: all real numbers less than or equal to 4
Answer: B
Type: MC
Objective: (2) Graphs in Rectangular Coordinates

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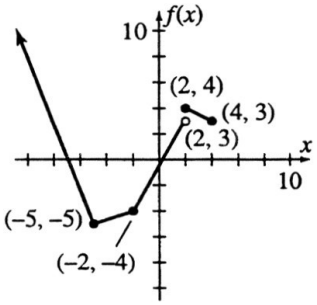
21) The x- and y-intercepts of the graph of $\frac{x^2}{4} + \frac{y^2}{9} = 1$ are

A) (4, 0), (0, 9).
B) (0, 4), (9, 0).
C) (0, ± 2) (± 3, 0).
D) (± 2, 0) (0, ± 3).
E) (0, 0), (2, 0), (0, 3).
Answer: D
Type: MC
Objective: (2) Graphs in Rectangular Coordinates

22) The x- and y-intercepts of the graph of $y = \frac{3}{x^2 - 1}$ are

A) (3, 0).
B) (0, -3).
C) (1,0), (0, 3).
D) (±1, 0), (0, 3).
E) (0, 0), (±1, 0), (0, -3).
Answer: B
Type: MC
Objective: (2) Graphs in Rectangular Coordinates

23) By looking a the graph below:
(a) list all values for which $f(x) = 0$
(b) $f(2) =$
(c) $f(-2) =$
(d) domain of f is?
(e) range of f is?

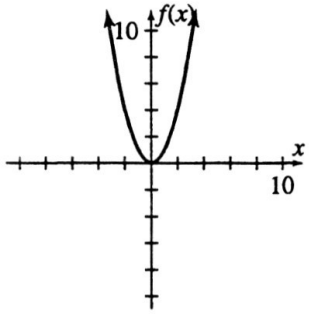


Answer:
(a) -7, 1
(b) 4
(c) -4
(d) $-\infty < x \leq 4$
(e) all real numbers greater than or equal to -5
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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24) By looking a the graph below:
(a) list all values for which $f(x) = -2$
(b) $f(-1) =$
(c) $f(0) =$
(d) domain of $f(x)$ is?
(e) range of $f(x)$ is?



Answer:
(a) none
(b) does not exist
(c) 0
(d) all reals
(e) all reals ≥ 0
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

25) Find the x-intercepts and the y-intercepts of $y = \frac{x^2 + 4x - 5}{3}$

Answer: (1, 0); (-5, 0) and $\left(0, -\frac{5}{3}\right)$
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

26) Use a graphing calculator to find all real roots of the equation. Round answers to two decimal places, if necessary: $(x - 1)^3 = 3 - x^2$
Answer: 1.65
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

27) Use a graphing calculator to find all real roots of the given function. Round answers to two decimal places, if necessary: $f(x) = x^3 - 8x - 3$
Answer: -2.62, -0.38, 3
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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28) Use a graphing calculator to find all real roots of the given function. Round answers to two decimal places, if necessary: $f(x) = x^4 - x^3 - 7x^2 + 5x + 10 = 0$
Answer: -2.24, -1, 2.24
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

29) Use a graphing calculator to find the maximum value of f(x) and the minimum value of f(x) for the indicated values of x:
$f(x) = 0.8x^4 - 3.1x^3 + 1.2x^2 + x + 1; 0 \le x \le 3$
Answer: minimum at (2.57, -6.23)
maximum at (0.56, 1.47)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

30) Tom has saved $1500 for a vacation. He plans to spend $250 a week on his vacation. Write an equation to represent the amount in savings and identify the intercepts.
Answer: $y = -250x + 1500$; x-intercept (6, 0); y-intercept (0, 1500)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

31) Bill has charged $2300 on his charge card. He plans to pay $60 a month on his charge cards. Write an equation to represent the amount he owes excluding any finance charges, and identify the intercepts.
Answer: $y = -60x + 2300$; x-intercept $\left(38\frac{1}{3}, 0\right)$; y-intercept (0, 2300)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

32) The train holds 175 passengers. It departs daily at 9:00 A.M. Let x represent the time and y represent the number of passengers. Write an equation which represents the relationship between the number of passengers on the train and the train's departure time. Describe the graph of this equation, and identify the intercepts.
Answer: $x = 9$; vertical line; x-intercept (9,0); no y-intercept
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

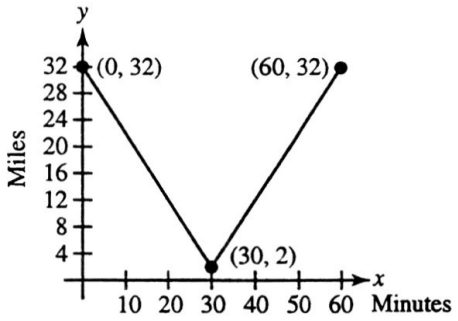
33) A daily round trip train ticket to the city costs $4.25. Let x represent the passenger's income and y represent the cost of a daily round trip train ticket. Write an equation which represents the relationship between the cost of a daily round trip ticket and a passenger's income; describe the graph of this equation, and identify the intercepts.
Answer: $y = 4.25$; horizontal line; no x-intercept; y-intercept (0, 4.25)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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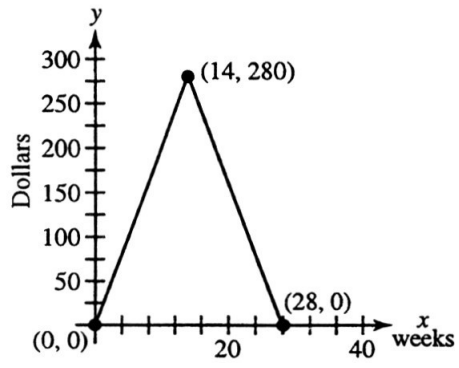
34) Ellen's health plan has a $10.00 copayment for complete pregnancy care. Let x represent the number of prenatal visits and y represent her cost for the pregnancy. Write an equation which represents the relationship between her cost for the pregnancy and her number of prenatal visits; describe the graph of this equation, and identify the intercepts.
Answer: $y = 10$; horizontal line; no x-intercept; y-intercept (0, 10)
Type: SA
Objective: (2) Graphs in Rectangular Coordinates

35) Julie lives 32 miles from the city. She drove home from the city at a constant rate of 60 mph along the highway. At the exit 2 miles from her home, she realized she had left her purse at the department store. She immediately returned to the department store at a rate of 60 mph. Graph the absolute-value function to represent Julie's distance from home as she drove home from the city over the appropriate domain.
Answer:



Type: SA
Objective: (2) Graphs in Rectangular Coordinates

36) In June, Gail decided to save $20.00 a week. She saved for 14 weeks and then for 14 weeks she spend $20.00 a week on gifts. Graph the absolute-value function to represent the amount of money Gail had in savings over the appropriate domain.
Answer:

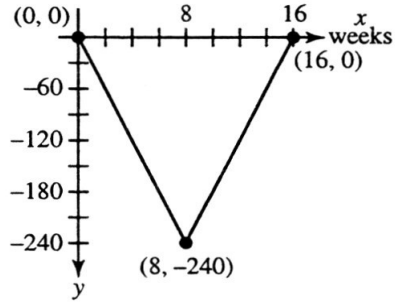


Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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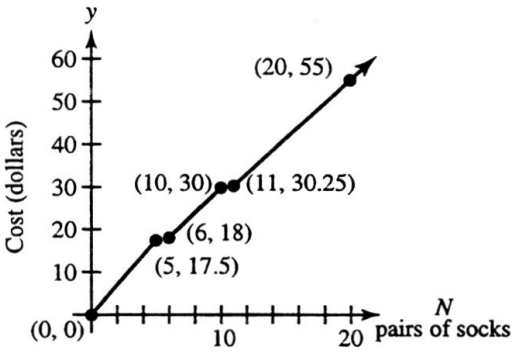
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37) In November, Steve uses his credit cards to buy $30.00 of holiday gifts each week. After 8 weeks he begins saving $30.00 each week to pay his credit card bill. Graph the absolute-value function to represent the amount Steve has saved since he started buying holiday gifts over the appropriate domain. (Hint: Let purchases on credit cards represent negative savings.)
Answer:



Type: SA
Objective: (2) Graphs in Rectangular Coordinates

38) To reduce inventory, a department store charges three rates. If you buy 0-5 pairs of socks, the price is $3.50 per pair of socks. If you buy 6-10 pairs of socks, the price is $3.00 per pair. If you buy more than 10, the price is $2.75 per pair. Graph the compound function that represents the cost of buying *N* pairs of socks.
Answer:

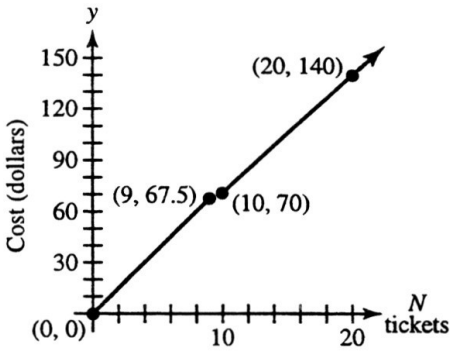


Type: SA
Objective: (2) Graphs in Rectangular Coordinates

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39) To encourage large group sales, a theater charges two rates. If your group is fewer than 10, each ticket costs $7.50. If your group is 10 or more, each ticket costs $7.00. Graph the compound function that represents the cost of buying N tickets.
Answer:



Type: SA
Objective: (2) Graphs in Rectangular Coordinates

2.6 Symmetry

Provide an appropriate response.

1) Determine whether the graph of $y = x - 2x^3$ is symmetric about the x-axis, the y-axis, the origin, or the line $y = x$.
Answer: origin
Type: SA
Objective: (2) Symmetry

2) Determine whether the graph of $y^2 = 4 - x^2$ is symmetric about the x-axis, the y-axis, the origin, or the line $y = x$.
Answer: x-axis, y-axis, origin, $y = x$
Type: SA
Objective: (2) Symmetry

3) Determine whether or not the graph of $y = \dfrac{x^2(x^2 - 9)}{x^4 + 4}$ is symmetric about the x-axis, the y-axis, the origin, or the line $y = x$.
Answer: y-axis
Type: SA
Objective: (2) Symmetry

4) Determine whether the graph $y = \dfrac{x^2 - 1}{x}$ is symmetric about the x-axis, the y-axis, the origin, or the line $y = x$.
Answer: origin
Type: SA
Objective: (2) Symmetry

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5) Determine whether the graph of $x = y^2 - 4$ is symmetric about the x-axis, the y-axis, the origin, or the line $y = x$.
Answer: x-axis
Type: SA
Objective: (2) Symmetry

6) Determine whether the graph of $x^2 - xy = 1$ is symmetric about the x-axis, the y-axis, the origin, or the line $y = x$.
Answer: origin
Type: SA
Objective: (2) Symmetry

7) Determine whether the graph of $y = x^2 - x^4$ is symmetric about the x-axis, the y-axis, the origin, or the line $y = x$.
Answer: y-axis
Type: SA
Objective: (2) Symmetry

8) Determine whether the graph of $\frac{x^2}{y^2 - 9} = 4$ is symmetric about the x-axis, the y-axis, the origin, or the line $y = x$.
Answer: x-axis, y-axis, origin
Type: SA
Objective: (2) Symmetry

9) Determine the x- and y-intercepts, if they exist, of the graph of $9x^2 + y^2 + 8y = 9$. Also determine whether the graph is symmetric about the x-axis, the y-axis, the origin, or the line $y = x$.
Answer: x-intercept: $(\pm 1, 0)$; y-intercept: $(0, 1)$, $(0, -9)$; symmetric about y-axis
Type: SA
Objective: (2) Symmetry

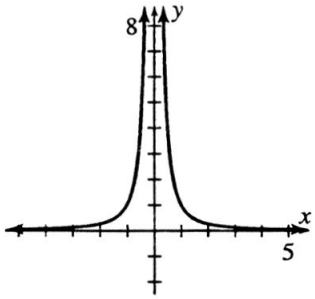
10) Determine the x-and y-intercepts, if they exist, of the graph of $\frac{x^2}{4} - \frac{y^2}{9} = 1$. Also determine whether the graph is symmetric about the x-axis, the y-axis, the origin, or the line $y = x$.
Answer: x-intercept: $(\pm 2, 0)$; no y-intercept; symmetric about x-axis, y-axis, origin
Type: SA
Objective: (2) Symmetry

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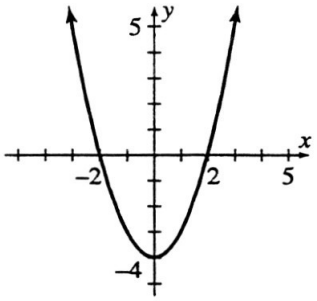
11) For the graph of $y = \frac{1}{x^2}$,

(a) Determine the intercepts.
(b) Determine whether the graph is symmetric about the *x*-axis, the *y*-axis, the origin, or the line $y = x$.
(c) Sketch the graph. (d) Based on your graph, is *y* a function of *x*? If so, state (e) the domain and (f) the range.
Answer:
(a) none
(b) *y*-axis
(c)



(d) *y* is a function of *x*
(e) all real numbers except 0
(f) all positive real numbers
Type: SA
Objective: (2) Symmetry

12) For the graph of $y = f(x) = x^2 - 4$,
(a) Determine the intercepts.
(b) Determine whether the graph is symmetric about the *x*-axis, *y*-axis, the origin, or the line $y = x$.
(c) Sketch the graph. State (d) the domain and (e) the range of *f*.
Answer:
(a) (2, 0), (-2, 0), (0, -4)
(b) *y*-axis
(c)



(d) all real numbers
(e) all real numbers greater than or equal to -4
Type: SA
Objective: (2) Symmetry

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13) The graph of $y = x^3$ is symmetric about the
A) x-axis only.
B) y-axis only.
C) origin only.
D) x-axis, y-axis, the origin, and the line $y = x$.
E) none of the above
Answer: C
Type: MC
Objective: (2) Symmetry

14) The graph of $y = \frac{x^2}{x^4 - 1}$ is symmetric about the

A) x-axis only.
B) y-axis only.
C) origin only.
D) x-axis, y-axis, the origin, and the line $y = x$.
E) none of the above
Answer: B
Type: MC
Objective: (2) Symmetry

15) Determine whether the graph of $y^2 = \frac{7 - 9x^2}{\frac{1}{x^2} - 1}$ is symmetric about the x-axis, the y-axis, the

origin, or the line $y = x$.
Answer: symmetric about the x-axis, y-axis and origin
Type: SA
Objective: (2) Symmetry

16) Determine whether the graph of $y = \frac{0.23 - 0.8x^2}{0.9 - 0.1x^2}$ is symmetric about the x-axis, the y-axis, the

origin, or the line $y = x$.
Answer: symmetric about the y-axis
Type: SA
Objective: (2) Symmetry

17) Determine the x-intercepts and y-intercepts if they exist. Also determine whether the graph is symmetric about the x-axis, y-axis, the origin, or the line $y = x$ for $3y^3 = x$.
Answer: (0, 0); symmetric about the origin
Type: SA
Objective: (2) Symmetry

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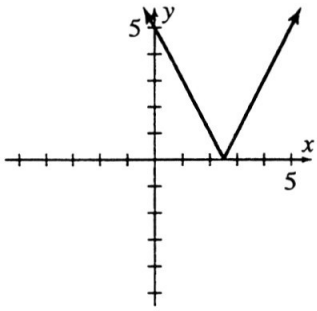
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18) Determine the x-intercepts if they exist. Also determine whether the graph is symmetric about the x-axis, y-axis, the origin, or the line $y = x$ for $y = |x|$.
Answer: (0, 0); symmetric about the y axis
Type: SA
Objective: (2) Symmetry

2.7 Translations and Reflections

Provide an appropriate response.

1) Sketch a graph of $y = |2x - 5|$
Answer:



Type: SA
Objective: (2) Translations and Reflections

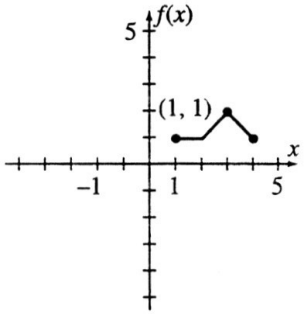
2) To obtain a graph of $y = 7x^2 + 3$ from the graph of $y = 7x^2$, which of the following statements is true?
A) shift 3 units to the left
B) shift 3 units to the right
C) shift 3 units up
D) shift 3 units down
E) none of the above
Answer: C
Type: MC
Objective: (2) Translations and Reflections

3) To obtain a graph of $y = 7(x - 1)^2$ from the graph of $y = 7x^2$, which of the following statements is true?
A) shift 1 unit to the left
B) shift 1 unit to the right
C) shift 1 unit up
D) shift 1 unit down
E) none of the above
Answer: B
Type: MC
Objective: (2) Translations and Reflections

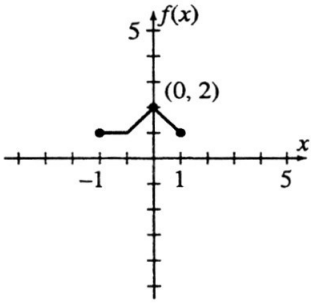
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4) Use the graph of $y = f(x)$.
Sketch a graph of $y = f(x + 3)$.



Answer: shift 3 units to the left

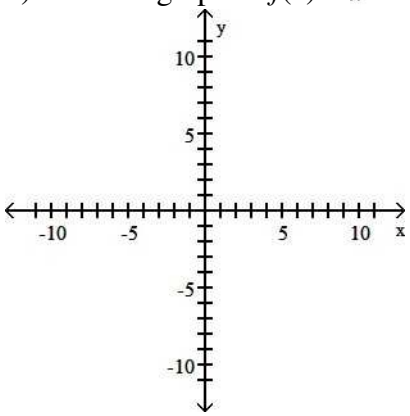


Type: SA
Objective: (2) Translations and Reflections

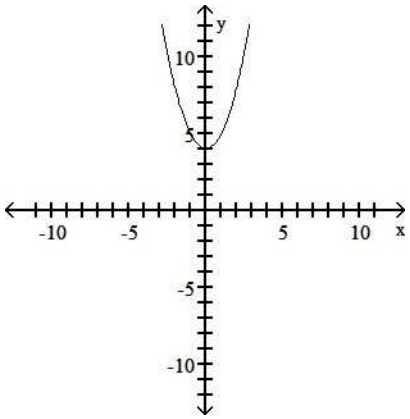
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5) Sketch a graph of $f(x) = x^2 + 4$



Answer:

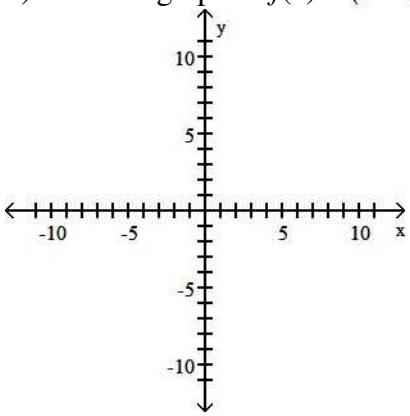


Type: SA
Objective: (2) Translations and Reflections

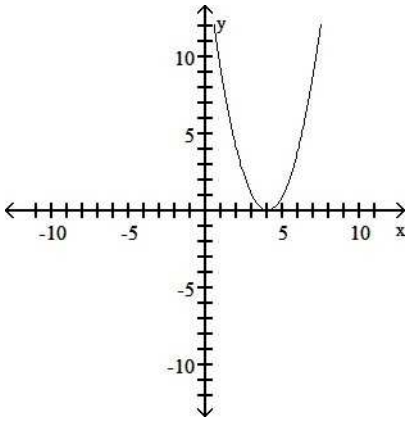
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6) Sketch a graph of $f(x) = (x - 4)^2$



Answer:

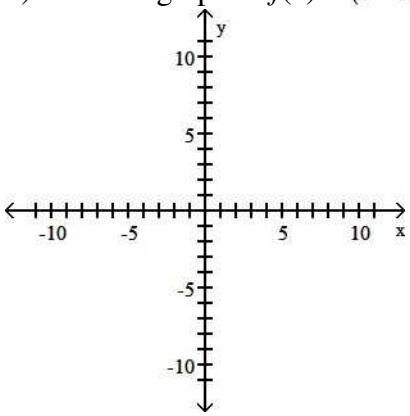


Type: SA
Objective: (2) Translations and Reflections

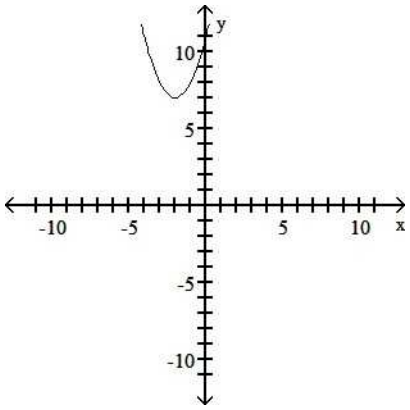
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7) Sketch a graph of $f(x) = (x + 2)^2 + 7$



Answer:

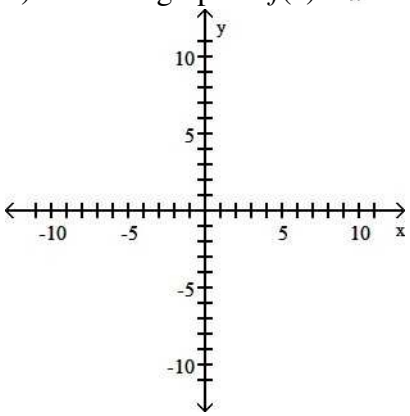


Type: SA
Objective: (2) Translations and Reflections

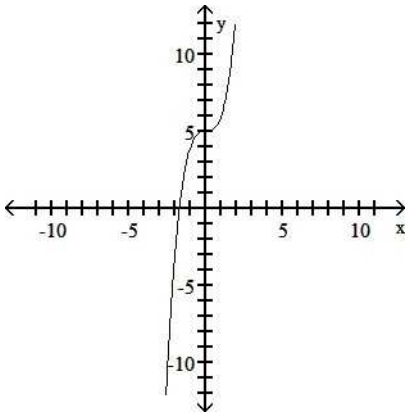
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8) Sketch a graph of $f(x) = x^3 + 5$



Answer:

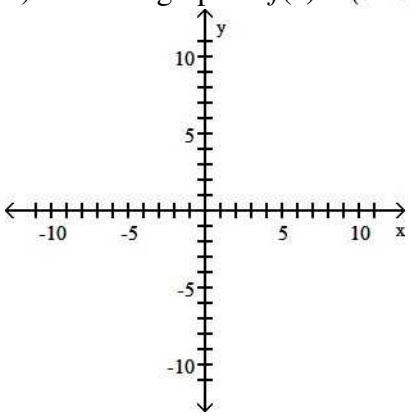


Type: SA
Objective: (2) Translations and Reflections

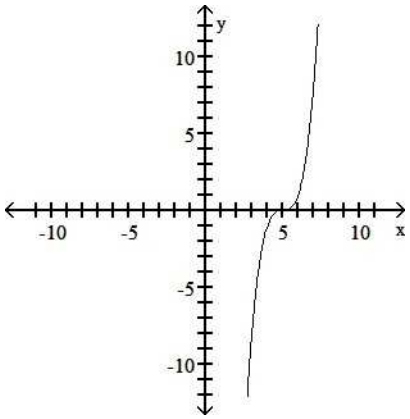
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9) Sketch a graph of $f(x) = (x - 5)^3$



Answer:

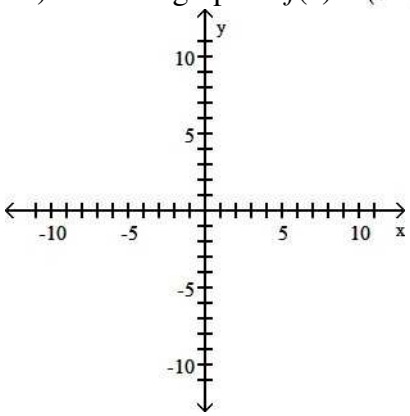


Type: SA
Objective: (2) Translations and Reflections

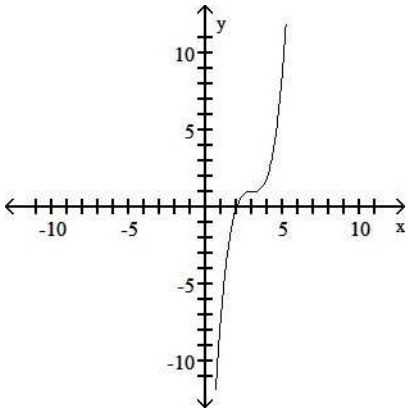
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10) Sketch a graph of $f(x) = (x - 3)^3 + 1$



Answer:

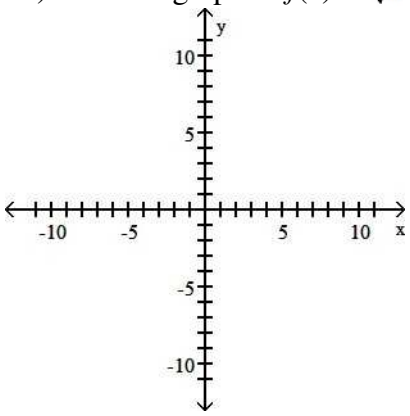


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Objective: (2) Translations and Reflections

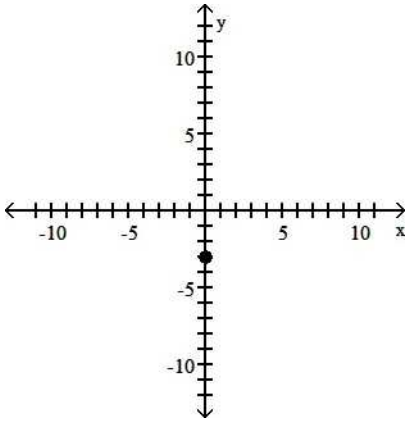
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11) Sketch a graph of $f(x) = \sqrt{x} - 3$



Answer:

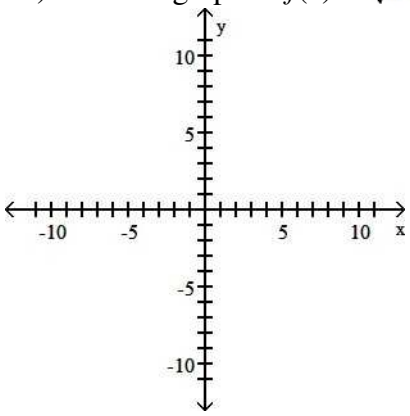


Type: SA
Objective: (2) Translations and Reflections

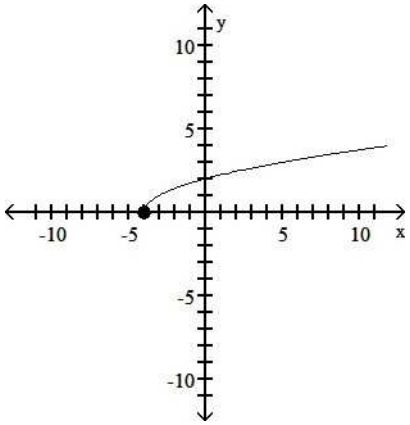
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12) Sketch a graph of $f(x) = \sqrt{x + 4}$



Answer:

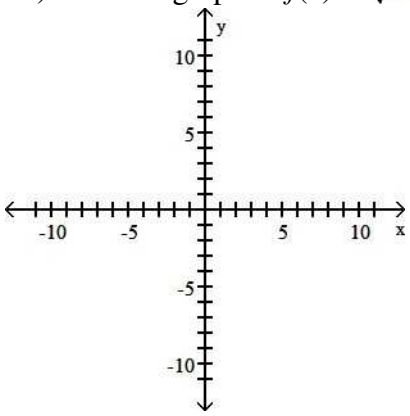


Type: SA
Objective: (2) Translations and Reflections

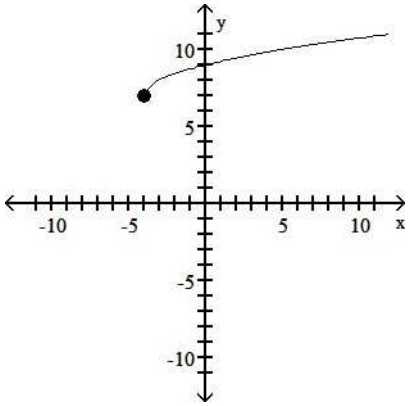
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13) Sketch a graph of $f(x) = \sqrt{x + 4} + 7$



Answer:

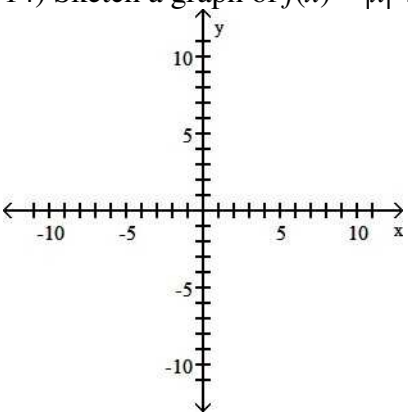


Type: SA
Objective: (2) Translations and Reflections

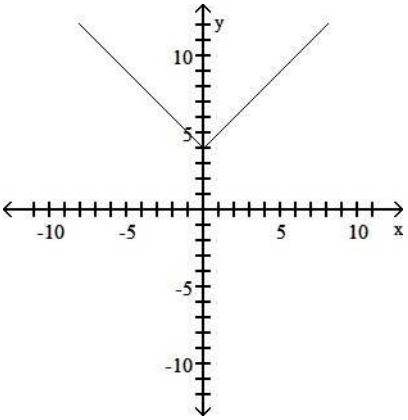
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14) Sketch a graph of $f(x) = |x| + 4$



Answer:

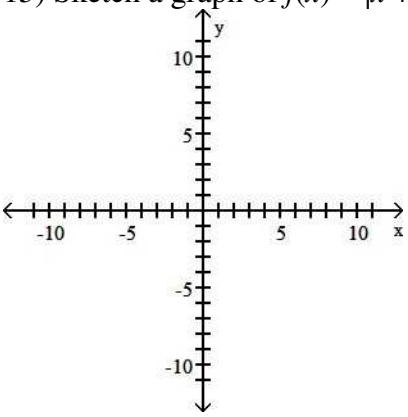


Type: SA
Objective: (2) Translations and Reflections

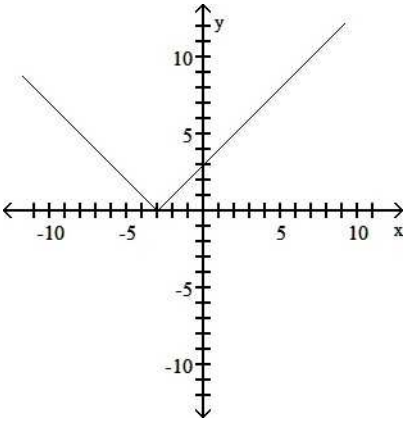
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15) Sketch a graph of $f(x) = |x + 3|$



Answer:

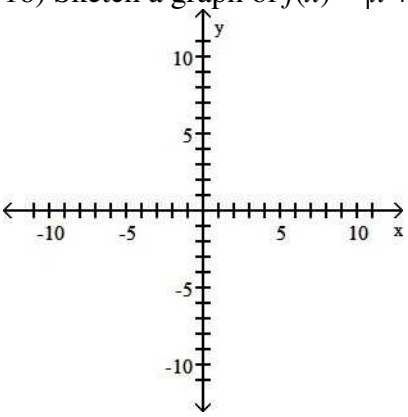


Type: SA
Objective: (2) Translations and Reflections

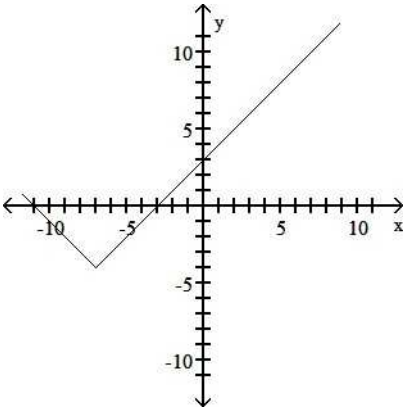
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16) Sketch a graph of $f(x) = |x + 7| - 4$



Answer:

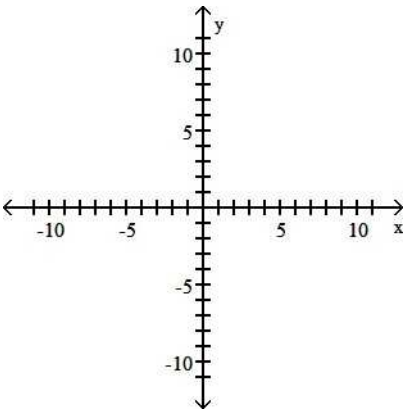


Type: SA
Objective: (2) Translations and Reflections

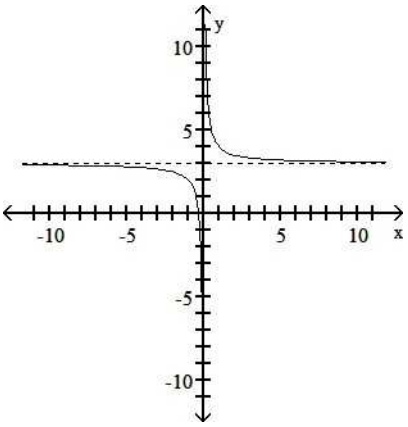
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17) Sketch a graph of $f(x) = \frac{1}{x} + 3$



Answer:

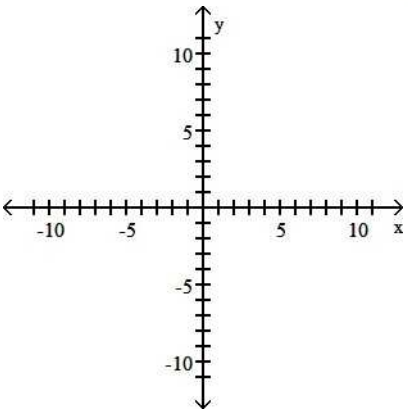


Type: SA
Objective: (2) Translations and Reflections

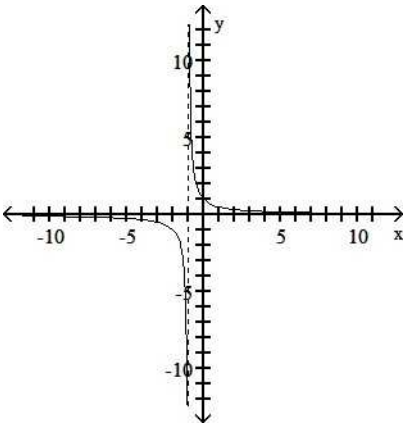
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18) Sketch a graph of $f(x) = \dfrac{1}{x+1}$



Answer:

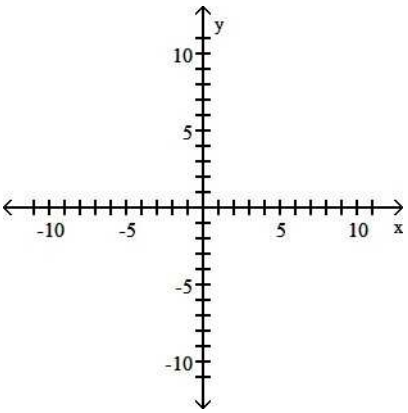


Type: SA
Objective: (2) Translations and Reflections

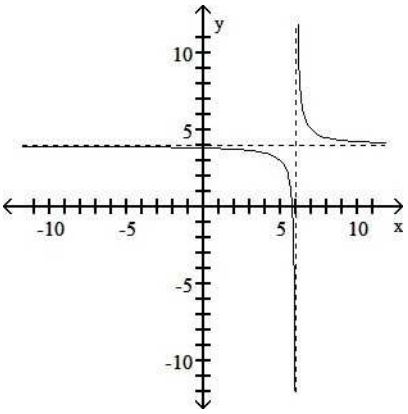
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19) Sketch a graph of $f(x) = \frac{1}{x - 6} + 4$



Answer:



Type: SA
Objective: (2) Translations and Reflections

20) List the graphical transformations, in the correct order, that must be done to $y = f(x)$ to produce the graph of $y = 2f(x + 3) - 5$.
Answer: Order: 1. Move 3 left
2. Vertical Stretch by 2
3. Move 5 down
Or any order in which 2. is before 3.
Type: SA
Objective: (2) Translations and Reflections

21) List the graphical transformations, in the correct order, that must be done to $y = f(x)$ to produce the graph of $y = -f(x - 5) + 4$.
Answer: Order: 1. Move 5 right
2. Reflect about the x-axis
3. Move 4 up
Or any order in which 2. is before 3.
Type: SA
Objective: (2) Translations and Reflections

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2.8 Functions of Several Variables

Provide an appropriate response.

1) If $f(x, y, z) = \frac{2x}{x + y}$, find $f(1, 2, -3)$.

Answer: -2
Type: SA
Objective: (2) Functions of Several Variables

2) If $f(p, q) = 3p^2 - 2q + p$, find $f(-1, 2)$.
Answer: -2
Type: SA
Objective: (2) Functions of Several Variables

3) Given the function $P(r, k) = \frac{k!\left(\frac{1}{4}\right)^r\left(\frac{3}{4}\right)^{k-r}}{r!(k - r)!}$, $r = 0, 1, 2, ..., k$; find $P(2, 4)$.

Answer: $\frac{27}{128}$

Type: SA
Objective: (2) Functions of Several Variables

4) Find an equation of the plane that is parallel to the y, z-plane and that passes through the point (1, 2, 3).
Answer: $x = 1$
Type: SA
Objective: (2) Functions of Several Variables

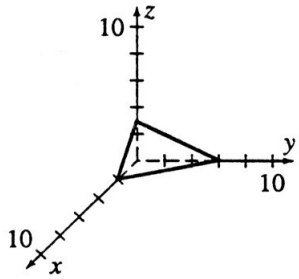
5) Find an equation of the plane that is parallel to the x, y-plane and that passes through the point (2, -6, 4).
Answer: $z = 4$
Type: SA
Objective: (2) Functions of Several Variables

6) Find an equation of the plane that is parallel to the x, z-plane and that passes through the point (-3, 2, 5).
Answer: $y = 2$
Type: SA
Objective: (2) Functions of Several Variables

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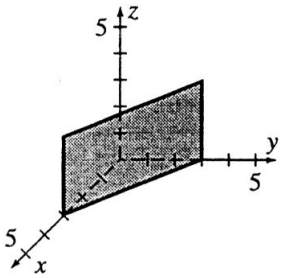
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7) Sketch the surface $3x + y + 2z = 6$.
Answer:



Type: SA
Objective: (2) Functions of Several Variables

8) Sketch the surface $x + y = 3$.
Answer:



Type: SA
Objective: (2) Functions of Several Variables

9) An equation of the plane that is parallel to the x, y-plane and that passes through (2, 7, 3) is
A) $x = 2$.
B) $y = 7$.
C) $z = 3$.
D) $x = 7$.
E) $y = 3$.
Answer: C
Type: MC
Objective: (2) Functions of Several Variables

10) An equation fo the plane that is parallel to the y, z-plane and that passes through (4, 6, 9) is
A) $x = 4$.
B) $y = 6$.
C) $z = 9$.
D) $x = 6$.
E) $z = 4$.
Answer: A
Type: MC
Objective: (2) Functions of Several Variables

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11) Given $f(x, y) = x^2 - yx$, find $f(u + v, u - v)$.
Answer: $2uv + 2v^2$
Type: SA
Objective: (2) Functions of Several Variables

12) Given $h(r, s, t, u) = \frac{rs}{3 - t^2}$, find $h(2, 3, 2, 15)$.

Answer: -6
Type: SA
Objective: (2) Functions of Several Variables

13) The Cobb-Douglas production function for a company is given by $P = 20l^{1/3}k^{2/3}$ where P is the monthly production value when k is the amount of the company's capital investment (in dollars per month) and l is the size of the labor force (in work hours per month). What is the production value when $l = 1728$ hours and $k = \$27{,}000$ per month?
Answer: $216,000
Type: SA
Objective: (2) Functions of Several Variables

14) The Cobb-Douglas production function for a company is given by $P = 70l^{1/4}k^{3/4}$ where P is the monthly production value when k is the amount of the company's capital investment (in dollars per month) and l is the size of the labor force (in work hours per month). What is the production value when $l = 2401$ hours and $k = \$10{,}000$ per month?
Answer: $490,000
Type: SA
Objective: (2) Functions of Several Variables

15) The Parkers are borrowing $120,000 to buy a house. Their monthly payment amount is given by
$P(n, r) = \frac{120{,}000r}{1 - (1 + r)^{-n}}$, where r is the monthly interest rate and n is the number of months. What is the Parker's monthly payment if they get:
(a) a 30-year loan at 9% annual interest?
(b) a 20-year loan at 10% annual interest?
Answer:
(a) $965.55 (b) $1158.03
Type: SA
Objective: (2) Functions of Several Variables

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