Calculus Volume 1 1st edition Strang Solutions Manual

SKU: 9781938168024-SOLUTIONS

Instructor Answer and Solution Guide

openstax™

Calculus

Volume 1

Calculus Volume 1 1st edition Strang Solutions Manual

Chapter 1
Functions and Graphs
1.1 Review of Functions

Section Exercises

For the following exercises, (a) determine the domain and the range of each relation, and (b) state whether the relation is a function.

1.

x	y	x	y
–3	9	1	1
–2	4	2	4
–1	1	3	9
0	0		

Answer: a. Domain = $\{-3,-2,-1,0,1,2,3\}$, range = $\{0,1,4,9\}$ b. Yes, a function

2.

x	y	x	y
–3	–2	1	1
–2	–8	2	8
–1	–1	3	–2
0	0		

Answer: a. Domain = $\{-3,-2,-1,0,1,2,3\}$, range = $\{-2,-8,-1,0,1,8\}$ b. Yes, a function

3.

x	y	x	y
1	–3	1	1
2	–2	2	2
3	–1	3	3
0	0		

Answer: a. Domain = $\{0,1,2,3\}$, range = $\{-3,-2,-1,0,1,2,3\}$ b. No, not a function

4.

x	y	x	y
1	1	5	1
2	1	6	1
3	1	7	1
4	1		

Answer: a. Domain = $\{1,2,3,4,5,6,7\}$, range = $\{1\}$ b. Yes, a function

Calculus Volume 1 1st edition Strang Solutions Manual

5.

x	y	x	y
3	3	15	1
5	2	21	2
8	1	33	3
10	0		

Answer: a. Domain = $\{3,5,8,10,15,21,33\}$, range = $\{0,1,2,3\}$ b. Yes, a function

6.

x	y	x	y
–7	11	1	–2
–2	5	3	4
–2	1	6	11
0	–1		

Answer: a. Domain = $\{-7,-2,0,1,3,6\}$, range = $\{-1,-2,1,4,5,11\}$ b. No, not a function

For the following exercises, find the values for each function, if they exist, then simplify.
a. $f(0)$ **b.** $f(1)$ **c.** $f(3)$ **d.** $f(-x)$ **e.** $f(a)$ **f.** $f(a+h)$

7. $f(x)=5x-2$

Answer: a. -2 b. 3 c. 13 d. $-5x-2$ e. $5a-2$ f. $5a+5h-2$

8. $f(x)=4x^2-3x+1$

Answer: a. 1 b. 2 c. 28 d. $4x^2+3x+1$ e. $4a^2-3a+1$ f. $4a^2+8ah+4h^2-3a-3h+1$

9. $f(x)=\dfrac{2}{x}$

Answer: a. Undefined b. 2 c $\dfrac{2}{3}$ d. $-\dfrac{2}{x}$ e $\dfrac{2}{a}$ f. $\dfrac{2}{a+h}$

10. $f(x)=|x-7|+8$

Answer: a. 15 b. 14 c. 12 d. $|-x-7|+8$ e. $|a-7|+8$ f. $|a+h-7|+8$

11. $f(x)=\sqrt{6x+5}$

Answer: a. $\sqrt{5}$ b. $\sqrt{11}$ c. $\sqrt{23}$ d. $\sqrt{-6x+5}$ e. $\sqrt{6a+5}$ f. $\sqrt{6a+6h+5}$

12. $f(x)=\dfrac{x-2}{3x+7}$

Answer: a. $-\dfrac{2}{7}$ b. $-\dfrac{1}{10}$ c. $\dfrac{1}{16}$ d. $-\dfrac{x+2}{7-3x}$ e. $\dfrac{a-2}{3a+7}$ f. $\dfrac{a+h-2}{3a+3h+7}$

Calculus Volume 1 1st edition Strang Solutions Manual

13. $f(x)=9$

Answer: a. 9 b. 9 c. 9 d. 9 e. 9 f. 9

For the following exercises, find the domain, range, and all zeros/intercepts, if any, of the functions.

14. $f(x)=\dfrac{x}{x^2-16}$

Answer: $x\neq\pm4$; all real numbers; $=0; y=0$

15. $g(x)=\sqrt{8x-1}$

Answer: $x\geq\dfrac{1}{8}; y\geq 0; x=\dfrac{1}{8}$; no y-intercept

16. $h(x)=\dfrac{3}{x^2+4}$

Answer: All real numbers; $0\leq y\leq\dfrac{3}{4}$; no x-intercept; $y=\dfrac{3}{4}$

17. $f(x)=-1+\sqrt{x+2}$

Answer: $x\geq -2; y\geq -1; x=-1; y=-1+\sqrt{2}$

18. $f(x)=\dfrac{1}{\sqrt{x-9}}$

Answer: $x>9; y>0$; no intercepts

19. $g(x)=\dfrac{3}{x-4}$

Answer: $x\neq 4; y\neq 0$; no x-intercept; $y=-\dfrac{3}{4}$

20. $f(x)=4|x+5|$

Answer: All real numbers; $y\geq 0; x=-5; y=20$

21. $g(x)=\sqrt{\dfrac{7}{x-5}}$

Answer: $x>5; y>0$; no intercepts

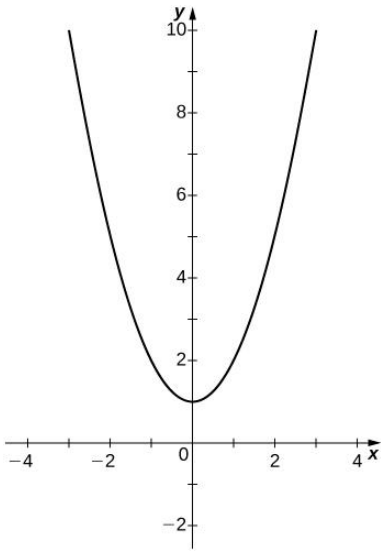
Calculus Volume 1 1st edition Strang Solutions Manual

For the following exercises, sketch the graph with the aid of the tables given:

22. $f(x)=x^2+1$

x	y	x	y
–3	10	1	2
–2	5	2	5
–1	2	3	10
0	1		

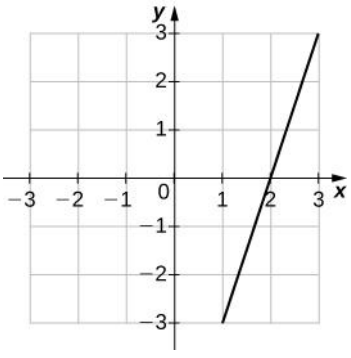
Answer:



23. $f(x)=3x-6$

x	y	x	y
–3	–15	1	–3
–2	–12	2	0
–1	–9	3	3
0	–6		

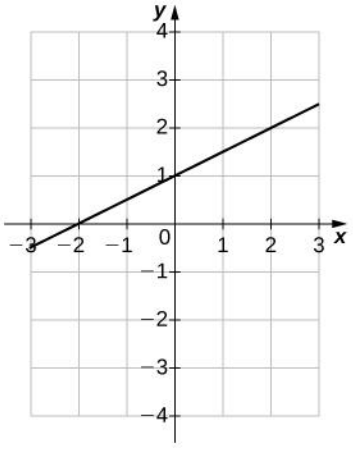
Answer:



24. $f(x)=\frac{1}{2}x+1$

x	y	x	y
–3	$-\frac{1}{2}$	1	$\frac{3}{2}$
–2	0	2	2
–1	$\frac{1}{2}$	3	$\frac{5}{2}$
0	1		

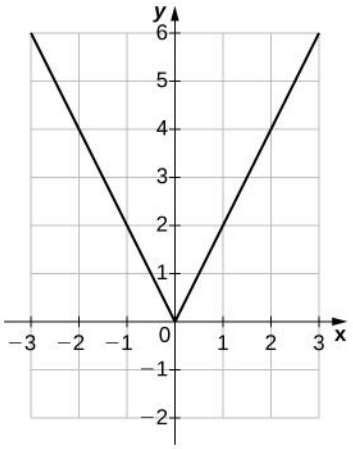
Answer:



25. $f(x)=2|x|$

x	y	x	y
–3	6	1	2
–2	4	2	4
–1	2	3	6
0	0		

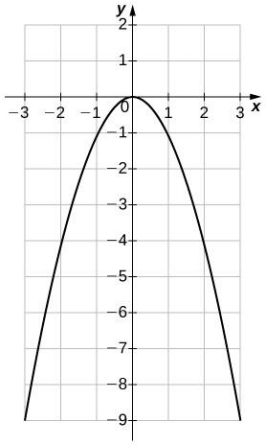
Answer:



26. $f(x) = -x^2$

x	y	x	y
–3	–9	1	–1
–2	–4	2	–4
–1	–1	3	–9
0	0		

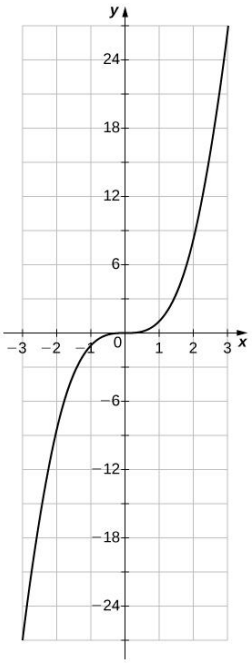
Answer:



27. $f(x) = x^3$

x	y	x	y
–3	–27	1	1
–2	–8	2	8
–1	–1	3	27
0	0		

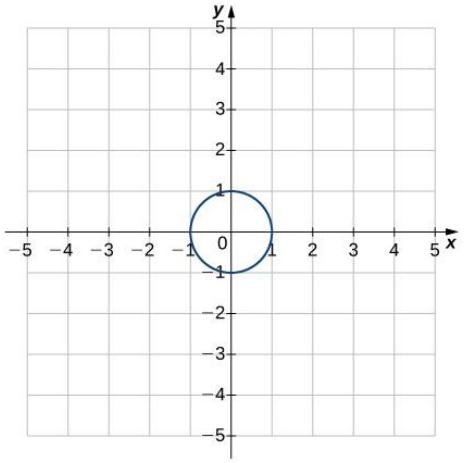
Answer:



For the following exercises, use the vertical line test to determine whether each of the given graphs represents a function. Assume that a graph continues at both ends if it extends beyond the given grid. If the graph represents a function, then determine the following for each graph:

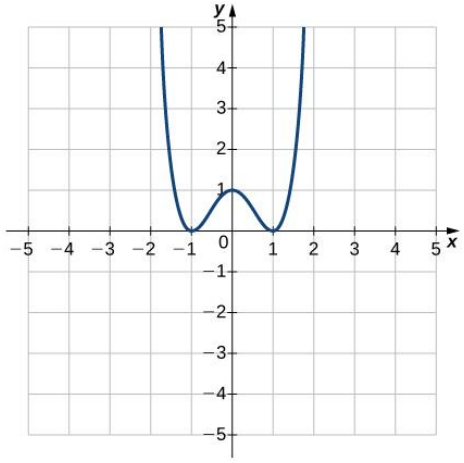
a. Domain and range
b. x-intercept, if any (estimate where necessary)
c. y-Intercept, if any (estimate where necessary)
d. The intervals for which the function is increasing
e. The intervals for which the function is decreasing
f. The intervals for which the function is constant
g. Symmetry about any axis and/or the origin
h. Whether the function is even, odd, or neither

28.



Answer: Not a function

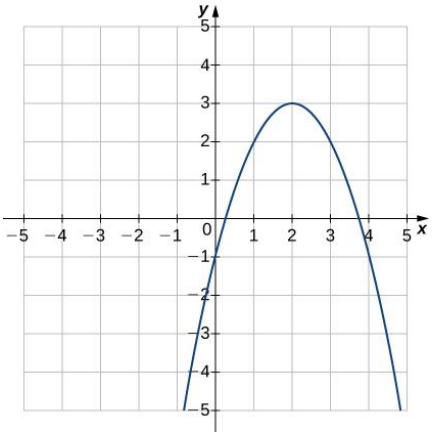
29.



Answer: Function; a. Domain: all real numbers, range: $y \geq 0$ b. $x = \pm 1$ c. $y = 1$ d. $-1 < x < 0$ and $1 < x < \infty$ e. $-\infty < x < -1$ and $0 < x < 1$ f. Not constant g. y-axis h. Even

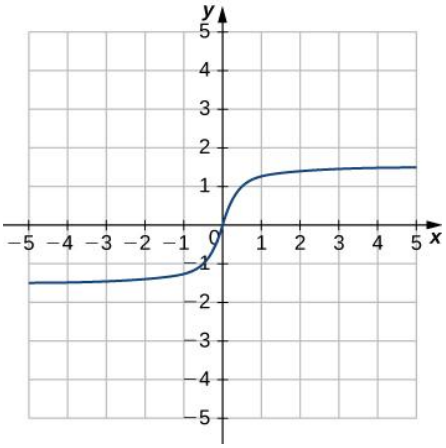
Calculus Volume 1 1st edition Strang Solutions Manual

30.



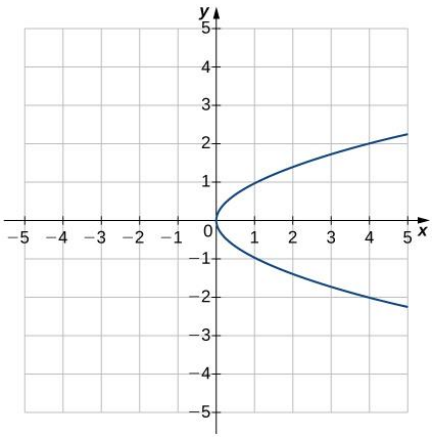
Answer: Function; a. Domain: all real numbers, range: $-\infty < y \le 3$ b. $x \sim 0.25, 3.75$ c. $y = -1$ d. $-\infty < x < 2$ e. $2 < x < \infty$ f. Not constant g. No symmetry h. Neither

31.



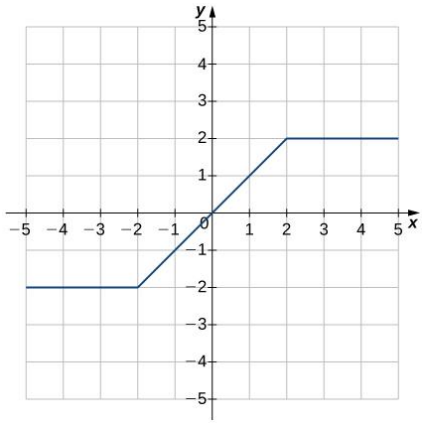
Answer: Function; a. Domain: all real numbers, range: $-1.5 \le y \le 1.5$ b. $x = 0$ c. $y = 0$ d. all real numbers e. None f. Not constant g. Origin h. Odd

32.



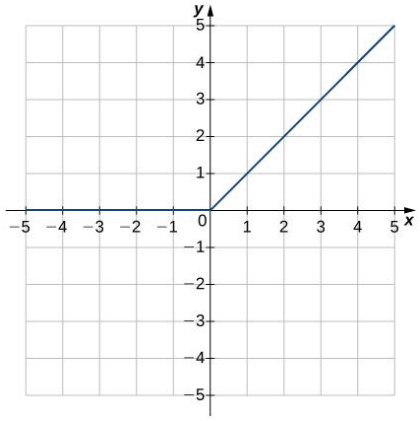
Answer: Not a function

33.



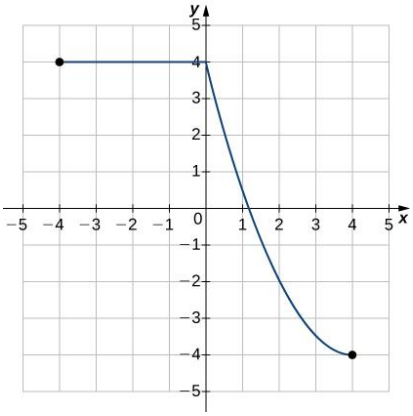
Answer: Function; a. Domain: $-\infty < x < \infty$, range: $-2 \le y \le 2$ b. $x = 0$ c. $y = 0$ d. $-2 < x < 2$ e. Not decreasing f. $-\infty < x < -2$ and $2 < x < \infty$ g. Origin h. Odd

34.



Answer: Function; a. Domain: all real numbers, range: $y \ge 0$ b. $x \le 0$ c. $y = 0$ d. $x > 0$ e. Not decreasing f. $-\infty < x < 0$ g. No symmetry h. Neither

35.



Answer: Function; a. Domain: $-4 \le x \le 4$, range: $-4 \le y \le 4$ b. $x = 1.2$ c. $y = 4$ d. Not increasing e. $0 < x < 4$ f. $-4 < x < 0$ g. No Symmetry h. Neither

Calculus Volume 1 1st edition Strang Solutions Manual

For the following exercises, for each pair of functions, find a. $f+g$ b. $f-g$ c. $f\cdot g$ d. f/g. Determine the domain of each of these new functions.

36. $f(x)=3x+4,\ g(x)=x-2$

Answer: a $4x+2$; all real numbers b. $2x+6$; all real numbers c. $3x^2-2x-8$; all real numbers d. $\frac{3x+4}{x-2};x\neq 2$

37. $f(x)=x-8,\ g(x)=5x^2$

Answer: a. $5x^2+x-8;$ all real numbers b. $-5x^2+x-8;$ all real numbers c. $5x^3-40x^2;$ all real numbers d. $\frac{x-8}{5x^2};\ x\neq 0$

38. $f(x)=3x^2+4x+1,\ g(x)=x+1$

Answer: a. $3x^2+5x+2$; all real numbers b. $3x^2+3x$; all real numbers c. $3x^3+7x^2+5x+1;$ all real numbers d. $3x+1;\ x\neq -1$

39. $f(x)=9-x^2,\ g(x)=x^2-2x-3$

Answer: a. $-2x+6;$ all real numbers b. $-2x^2+2x+12;$ all real numbers c. $-x^4+2x^3+12x^2-18x-27;$ all real numbers d. $-\frac{x+3}{x+1};\ x\neq -1,3$

40. $f(x)=\sqrt{x},\ g(x)=x-2$

Answer: a. $\sqrt{x}+x-2;\ x\geq 0$ b. $\sqrt{x}-x+2;\ x\geq 0$ c. $\sqrt{x^3}-2\sqrt{x};\ x\geq 0$ d. $\frac{\sqrt{x}}{x-2};\ x\neq 2,x\geq 0$

41. $f(x)=6+\frac{1}{x},\ g(x)=\frac{1}{x}$

Answer: a. $6+\frac{2}{x};\ x\neq 0$ b. $6;\ x\neq 0$ c. $\frac{6}{x}+\frac{1}{x^2};\ x\neq 0$ d. $6x+1;\ x\neq 0$

For the following exercises, for each pair of functions, find a. $(f\circ g)(x)$ and b. $(g\circ f)(x)$ Simplify the results. Find the domain of each of the results.

42. $f(x)=3x,\ g(x)=x+5$

Answer: a. $3x+15;$ all real numbers b. $3x+5;$ all real numbers

43. $f(x)=x+4,\ g(x)=4x-1$

Answer: a. $4x+3;$ all real numbers b. $4x+15;$ all real numbers

Calculus Volume 1 1st edition Strang Solutions Manual

44. $f(x)=2x+4,\ g(x)=x^2-2$

Answer: a. $2x^2$; all real numbers b. $4x^2+16x+14$; all real numbers

45. $f(x)=x^2+7,\ g(x)=x^2-3$

Answer: a. x^4-6x^2+16; all real numbers b. x^4+14x^2+46; all real numbers

46. $f(x)=\sqrt{x},\ g(x)=x+9$

Answer: a. $\sqrt{x+9};\ x\geq -9$ b. $\sqrt{x}+9; x\geq 0$

47. $f(x)=\dfrac{3}{2x+1},\ g(x)=\dfrac{2}{x}$

Answer: a. $\dfrac{3x}{4+x}; x\neq 0,-4$ b. $\dfrac{4x+2}{3};\ x\neq -\dfrac{1}{2}$

48. $f(x)=|x+1|,\ g(x)=x^2+x-4$

Answer: a. $|x^2+x-3|$; all real numbers b. $x^2+2x+|x+1|-3$; all real numbers

49. The table below lists the NBA championship winners for the years 2001 to 2012.

Year	**Winner**
2001	LA Lakers
2002	LA Lakers
2003	San Antonio Spurs
2004	Detroit Pistons
2005	San Antonio Spurs
2006	Miami Heat
2007	San Antonio Spurs
2008	Boston Celtics
2009	LA Lakers
2010	LA Lakers
2011	Dallas Mavericks
2012	Miami Heat

a. Consider the relation in which the domain values are the years 2001 to 2012 and the range is the corresponding winner. Is this relation a function? Explain why or why not.
b. Consider the relation where the domain values are the winners and the range is the corresponding years. Is this relation a function? Explain why or why not.

Answer: a. Yes, because there is only one winner for each year. b. No, because there are three teams that won more than once during the years 2001 to 2012

Calculus Volume 1 1st edition Strang Solutions Manual