College Math – Chapter One Answers

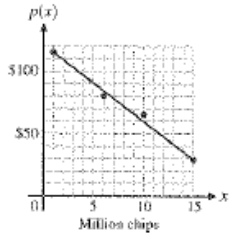
CHAPTER 1

Exercise 1-1

1. Function **3.** Not a function **5.** Function **7.** Function **9.** Not a function **11.** Function **13.** 4 **15.** -5 **17.** -6
19. -2 **21.** -12 **23.** -1 **25.** -6 **27.** 12 **29.** $\frac{1}{2}$ **31.** $y = 0$ **33.** $y = 4$ **35.** $x = -5, 0, 4$ **37.** $x = -6$
39. All real numbers **41.** All real numbers except -4 **43.** All real numbers except -4 and 1 **45.** All real numbers, except -3
47. $x \leq 7$ **49.** $x < 7$
51. $f(2) = 0$, and 0 is a number; therefore, $f(2)$ exists. On the other hand, $f(3)$ is not defined, since the denominator assumes a value of 0; therefore, we say that $f(3)$ does not exist.
53. $g(x) = 2x^3 - 5$ **55.** $G(x) = 2\sqrt{x} - x^2$ **57.** Function f multiplies the domain element by 2 and subtracts 3 from the result.
59. Function F multiplies the cube of the domain element by 3 and subtracts twice the square root of the domain element from the result.
61. A function with domain R **63.** A function with domain R **65.** Not a function; for example, when $x = 1$, $y = \pm 3$
67. A function with domain all real numbers except $x = 4$ **69.** Not a function; for example, when $x = 4$, $y = \pm 3$ **71.** 4 **73.** $h + 2$

75. $h - 1$ **77.** 4 **79.** $8a + 4h - 7$ **81.** $3a^2 + 3ah + h^2$ **83.** $\dfrac{1}{\sqrt{a+h} + \sqrt{a}}$ **85.** $P(w) = 2w + \dfrac{50}{w}$, $w > 0$

87. $A(\ell) = \ell(50 - \ell)$, $0 \leq \ell \leq 50$ **89.** $p(x)$

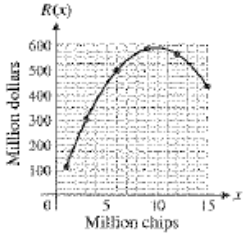


$p(8) = 71$ dollars per chip; $p(11) = 53$ dollars per chip

91. (A) $R(x) = xp(x) = x(119 - 6x)$ million dollars; Domain: $1 \leq x \leq 15$ (B)

x (million)	$R(x)$ (million \$)
1	113
3	303
6	498
9	585
12	564
15	435

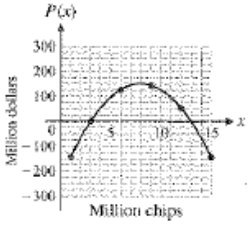
(C) $R(x)$



93. (A) $P(x) = R(x) - C(x) = x(119 - 6x) - (234 + 23x)$ million dollars; Domain: $1 \leq x \leq 15$ (B)

x (million)	$P(x)$ (million \$)
1	-144
3	0
6	126
9	144
12	54
15	-144

(C) $P(x)$



A-1

2. Function **4.** Not a function **6.** Function

8. Function **10.** Not a function **12.** Not a function

14. 1 **16.** -8 **18.** 0 **20.** -1 **22.** -6 **24.** 4

26. 13 **28.** 0 **30.** -3 **32.** y = 0 **34.** y = 3

36. x = -4, -2 **38.** x = 5 **40.** All real numbers

42. All real numbers, except 2 **44.** All real numbers, except -3 and 2

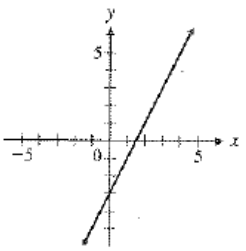
46. All real numbers, except -4 **48.** x ≥ -5 **50.** x > -5

52. f(-2) = 0, and 0 is a number, therefore, f(-2) exists. On the other hand, f(-3) is not defined, since the denominator assumes a value of zero, therefore, we say that f(-3) does not exist.

54. f(x) = -3x + 4 **56.** $F(x) = -8x^3 + 3\sqrt{3}$

Exercise 1-3

1. (D) **3.** (C); slope is 0 **5.**



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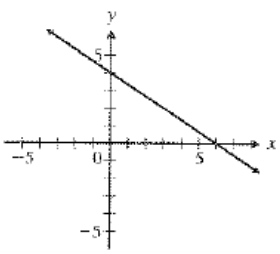
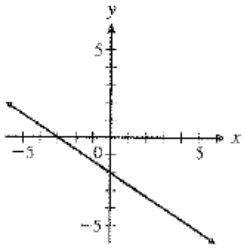


9. Slope = 2; y intercept = -3
11. Slope = $-\frac{2}{3}$; y intercept = 2
13. $y = -2x + 4$
15. $y = -\frac{2}{5}x + 3$

17.



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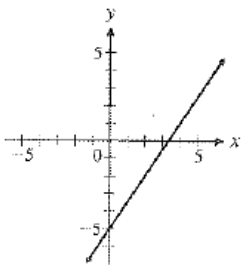

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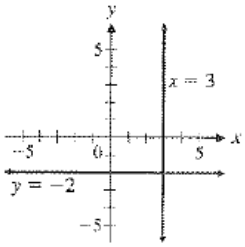
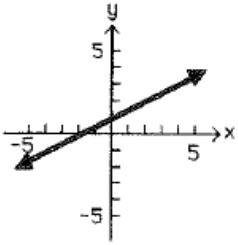


23. $y = -3x + 5$; $m = -3$
25. $y = -\frac{2}{3}x + 4$; $m = -\frac{2}{3}$

2. (a) **4.** (b); slope is not defined for a vertical line

6.



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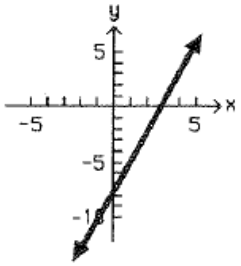
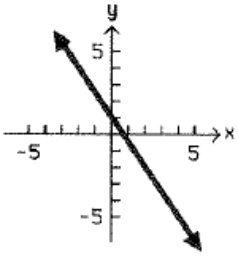


10. $\frac{1}{2}$, 1 **12.** Slope = $\frac{3}{4}$; intercept = −2 **14.** $y = -\frac{2}{3}x - 2$

16. $y = x - 2$

18.



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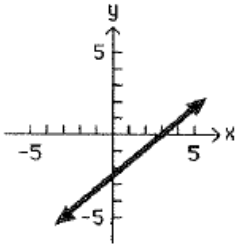

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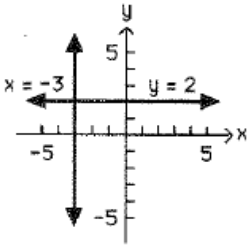


24. $y = 2x + 3$, $m = 2$ **26.** $y = \frac{3}{2}x - 5$, $m = \frac{3}{2}$

30. $x = -2$, $y = 7$ **32.** $x = 6$, $y = -4$

34. $y - 2 = -2(x + 3)$, $y = -2x - 4$ **36.** $y - 3 = \frac{1}{2}(x + 4)$, $y = \frac{x}{2} + 5$

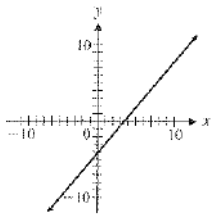
38. $y = 0x + 7$ or $y = 7$ **40.** $\frac{1}{2}$ **42.** $\frac{1}{3}$

44. Not defined **46.** 0

48. $y - 1 = \frac{1}{2}(x - 2)$, $x - 2y = 0$ **50.** $y - 7 = \frac{1}{3}(x - 3)$, $x - 3y = -18$

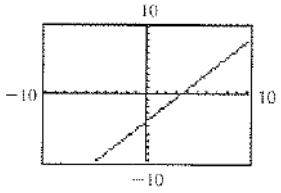
52. $x = -2$ **54.** $y = -3$

27. (A)



(B) x intercept: 3.5; y intercept: -4.2

(C)



(D) x intercept: 3.5; y intercept: -4.2

(E) $x > 3.5$ or $(3.5, \infty)$

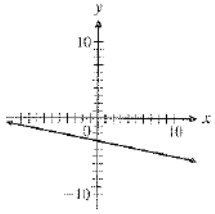
29. $x = 3$; $y = -5$ **31.** $x = -1$; $y = -3$ **33.** $y + 1 = -3(x - 4)$; $y = -3x + 11$

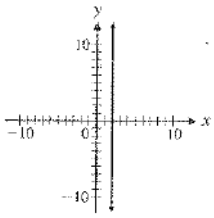
35. $y + 5 = \frac{2}{3}(x + 6)$; $y = \frac{2}{3}x - 1$ **37.** $y = 0x - 5$, or $y = -5$ **39.** $\frac{1}{3}$ **41.** $-\frac{1}{8}$

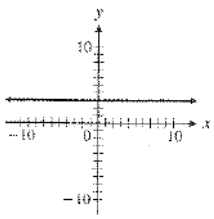
43. Not defined **45.** 0 **47.** $(y - 3) = \frac{1}{3}(x - 1)$; $x - 3y = -8$

49. $(y + 2) = -\frac{1}{3}(x + 5)$; $x + 5y = -15$ **51.** $x = 2$ **53.** $y = 3$

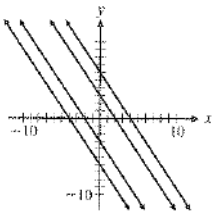
55. A linear function **57.** Not a function **59.** A constant function







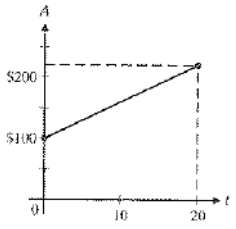
61. (A)



(B) Varying C produces a family of parallel lines. This is verified by observing that varying C does not change the slope of the lines but changes the intercepts.

63. (A) \$130; \$220

(B)

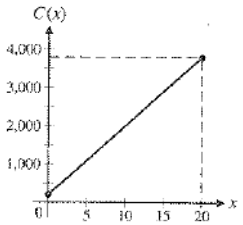


(C) 6

65. (A) $C(x) = 180x + 200$

(B) \$2,360

(C)



Exercise 1-4

1. (A), (C), (E), (F) **3.** (A) m (B) g (C) f (D) n

5. (A) x intercepts: 1, 3; y intercept: -3
(B) Vertex: (2, 1) (C) Maximum: 1
(D) Range: $y \leq 1$ or $(-\infty, 1]$
(E) Increasing interval: $x \leq 2$ or $(-\infty, 2]$
(F) Decreasing interval: $x \geq 2$ or $[2, \infty)$

7. (A) x intercepts: -3, -1; y intercept: 3
(B) Vertex: $(-2, -1)$ (C) Minimum: -1
(D) Range: $y \geq -1$ or $[-1, \infty)$
(E) Increasing interval: $x \geq -2$ or $[-2, \infty)$
(F) Decreasing interval: $x \leq -2$ or $(-\infty, -2]$

9. (A) x intercepts: 1, 3; y intercept: -3
(B) Vertex: (2, 1) (C) Maximum: 1
(D) Range: $y \leq 1$ or $(-\infty, 1]$

2. (b), (d), (e), (f) **4.** (A) g (B) m (C) n (D) f

6. (A) x intercepts: -5, -1; y intercept: -5 (B) Vertex: (-3, 4)
(C) Maximum: 4 (D) Range: $y \leq 4$ or $(-\infty, 4]$
(E) Increasing interval: $x \leq -3$ or $(-\infty, -3]$
(F) Decreasing interval: $x \geq -3$ or $[-3, \infty)$

8. (A) x intercepts: 1, 5; y intercept: 5 (B) Vertex: (3, -4)
(C) Minimum: -4 (D) Range: $y \geq -4$ or $[-4, \infty)$
(E) Increasing interval: $x \geq 3$ or $[3, \infty)$
(F) Decreasing interval: $x \leq 3$ or $(-\infty, 3]$

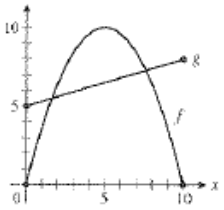
10. (A) x intercepts: -5, -1; y intercept: -5 (B) Vertex: (-3, 4)
(C) Maximum: 4 (D) Range: $y \leq 4$ or $(-\infty, 4]$

12. (A) x intercepts: 1, 5; y intercept: 5 (B) Vertex: (3, -4)
(C) Minimum: -4 (D) Range: $y \geq -4$ or $[-4, \infty)$

14. $y = -(x - 4)^2 + 2$ **16.** $y = [x - (-3)]^2 + 1$ or $y = (x + 3)^2 + 1$

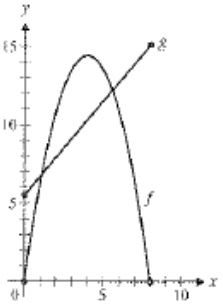
18. $g(x) = (x + 5)^2 - 5$
(A) x intercepts: -7.2, -2.8; y intercept: 20
(B) Vertex: (-5, -5) (C) Minimum: -5
(D) Range: $y \geq -5$ or $[-5, \infty)$

11. (A) x intercepts: $-3, -1$; y intercept: 3 (B) Vertex: $(-2, -1)$ (C) Minimum: -1 (D) Range: $y \geq -1$ or $[-1, \infty)$
13. $y = -[x - (-2)]^2 + 5$ or $y = -(x + 2)^2 + 5$ **15.** $y = (x - 1)^2 - 3$
17. $f(x) = (x - 4)^2 - 3$ (A) x intercepts: 2.3, 5.7; y intercept: 13 (B) Vertex: $(4, -3)$ (C) Minimum: -3 (D) Range: $y \geq -3$ or $[-3$
19. $M(x) = -(x + 3)^2 + 10$ (A) x intercepts: -6.2, 0.2; y intercept: 1 (B) Vertex: $(-3, 10)$ (C) Maximum: 10
(D) Range: $y \leq 10$ or $(-\infty, 10]$
21. $G(x) = 0.5(x - 4)^2 + 2$ (A) x intercepts: none; y intercept: 10 (B) Vertex: (4, 2) (C) Minimum: 2 (D) Range: $y \geq 2$ or $[2, \infty)$
23. The vertex of the parabola is on the x axis.
25. $g(x) = 0.25(x - 3)^2 - 9.25$ (A) x intercepts: -3.08, 9.08; intercept:-7 (B) Vertex: $(3,-9.25)$ (C) Minimum: -9.25
(D) Range: $y \geq -9.25$ or $[-9.25, \infty)$
27. $f(x) = -0.12(x - 4)^2 + 3.12$ (A) x intercepts: -1.1, 9.1; y intercept: 1.2 (B) Vertex: (4, 3.12) (C) Maximum: 3.12
(D) Range: $y \leq 3.12$ or $(-\infty, 3.12]$
29. $x = -5.37, 0.37$ **31.** $-1.37 < x < 2.16$ **33.** $x \leq -0.74$ or $x \geq 4.19$
35. (A)



(B) 1.64, 7.61
(C) $1.64 < x < 7.61$
(D) $0 \leq x < 1.64$ or $7.61 < x \leq 10$

37. (A)

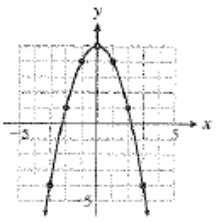


(B) 1.10, 5.57
(C) $1.10 < x < 5.57$
(D) $0 \leq x < 1.10$ or $5.57 < x \leq 8$

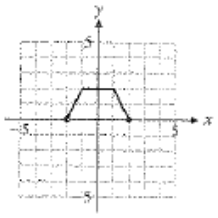
39. $f(x) = x^2 + 1$ and $g(x) = -(x - 4)^2 - 1$ are two examples. The graphs do not cross the x axis.

Chapter 1 Review Exercise

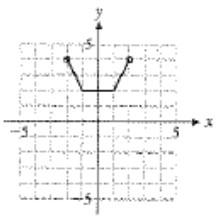
1. *(1-1)*



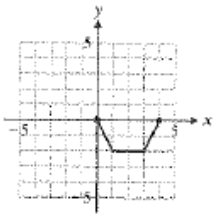
2. (A) Not a function (B) A function (C) A function (D) Not a function *(1-1)*
3. (A) -2 (B) -8 (C) 0 (D) Not defined *(1-1)*
4. (A) $y = 4$ (B) $x = 0$ (C) $y = 1$ (D) $x = -1$ or 1 (E) $y = -2$ (F) $y = -5$ or 5 *(1-1)*
5. (A)



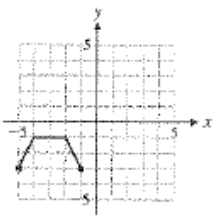
(B)



(C)

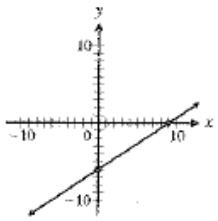


(D)



(1-2)

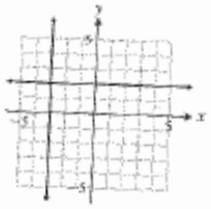
6. (A) n (B) g (C) m; slope is zero (D) f; slope is not defined *(1-3)* **7.** $y = -\frac{3}{5}x + 6$ *(1-3)*
8. Vertical line: $x = -6$; Horizontal line: $y = 5$ *(1-3)*
9. x intercept $= 9$; y intercept $= -6$; Slope $= \frac{2}{3}$ *(1-3)*



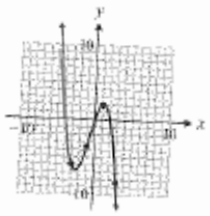
10. (B), (C), (D), (F) *(1-4)*
11. (A) g (B) m (C) n (D) f *(1-2, 1-4)*
12. (A) x intercepts: -4, 0; y intercept: 0
(B) Vertex: $(-2, -4)$ (C) Minimum: -4
(D) Range: $y \geq -4$ or $[-4, \infty)$
(E) Increasing on $[-2, \infty)$
(F) Decreasing on $(-\infty, -2]$ *(1-4)*
13. Linear functions: (A), (C), (E), (F); Constant function: (D) *(1-3)*
14. (A) All real numbers except $x = -2$ and 3
(B) $x < 5$ *(1-1)*

15. Function g multiplies a domain element by 2 and then subtracts 3 times the square root of the domain element from the result. *(1-1)*

16. The graph of $x = -3$ is a vertical line with x intercept -3, and the graph of $y = 2$ is a horizontal line with y intercept 2. *(1-3)*



17. *(1-1)*



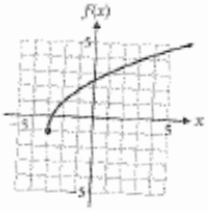
18. -2 *(1-1)* **19.** $2a + h - 3$ *(1-1)*

20. The graph of function m is the graph of $y = |x|$ reflected in the x axis and shifted to the right 4 units. *(1-2)*

21. The graph of function g is the graph of $y = x^3$ vertically contracted by a factor of 0.3 and shifted up 3 units. *(1-2)*

22. The graph of $y = x^2$ is vertically expanded by a factor of 2, reflected in the x axis, and shifted to the left 3 units. Equation: $y = -2(x + 3)^2$. *(1*

23. $f(x) = 2\sqrt{x + 3} - 1$ *(1-2)*



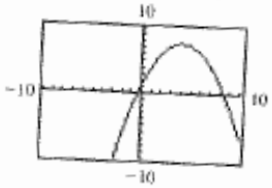
24. (A) $y = -\frac{2}{3}x$ (B) $y = 3$ *(1-3)*

25. (A) $3x + 2y = 1$ (B) $y = 5$ (C) $x = -2$ *(1-3)*

26. $y = -(x - 4)^2 + 3$ *(1-2, 1-4)*

27. $f(x) = -0.4(x - 4)^2 + 7.6$ (A) x intercepts: -0.4, 8.4; y intercept: 1.2 (B) Vertex: (4.0, 7.6) (C) Maximum: 7.6 (D) Range: $x \le 7.6$ or $(-\infty, 7.6]$ *(1-4)*

28.



(A) x intercepts: -0.4, 8.4; y intercept: 1.2
(B) Vertex: (4.0, 7.6)
(C) Maximum: 7.6
(D) Range: $x \le 7.6$ or $(-\infty, 7.6]$ *(1-4)*

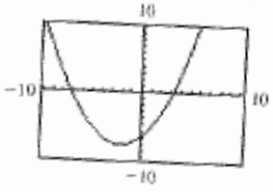
29. The graph of $y = \sqrt[3]{x}$ is vertically expanded by a factor of 2, reflected in the x axis, and shifted 1 unit left and 1 unit down. Equation: $y = -2\sqrt[3]{x + 1} - 1$. *(1-2)*

30. The graphs appear to be perpendicular to each other. (It can be shown that if the slopes of two slant lines are the negative reciprocals of each other then the two lines are perpendicular.) *(1-3)*

31. (A) $\dfrac{1}{\sqrt{x + h} + \sqrt{x}}$ (B) $\dfrac{-1}{x(x + h)}$ *(1-2)*

32. $G(x) = 0.3(x + 2)^2 - 8.1$ (A) x intercepts: -7.2, 3.2; y intercept: -6.9 (B) Vertex: $(-2, -8.1)$ (C) Minimum: -8.1 (D) Range: $x \ge -8.1$ or $[-8.1, \infty)$ (E) Decreasing: $(-\infty, -2]$; Increasing: $[-2, \infty)$ *(1-4)*

33.



(A) x intercepts: -7.2, 3.2; y intercept: -6.9
(B) Vertex: $(-2, -8.1)$ (C) Minimum: -8.1
(D) Range: $x \ge -8.1$ or $[-8.1, \infty)$
(E) Decreasing: $(-\infty, -2]$; Increasing: $[-2, \infty)$ *(1-4)*

34. (A) $V(t) = -1{,}250t + 12{,}000$, $0 \le t \le 8$