Exam 1 Review Answers

Chapter 1 Review Exercises

1. $y = 2x - 10$

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

6. $y = k(x-1)(x-5)(x-7)$, where $k \neq 0$ is a constant

7. $y = \dfrac{-5x}{x-2}$

8. $y = 5\cos(x)$

10. Domain: All x except $x \neq 0, -1$; $g(x) = 0$ when $x = \pm 2$

11. **(a)** $0 \leq x \leq 7$

(b) $-2 \leq y \leq 5$

(c) $x = 5$

(d) $1 \leq x \leq 7$

(e) Concave up

(f) 2

(g) No

12. **(a)** $3n^2 + n - 1$

(b) $3n^3 + 3n^2 - 2n - 2$

(c) All n with $n \neq -1$

(d) $3n^2 + 6n + 1$

(e) $3n^2 - 1$

13. **(a)** $f(100)$ represents the minimum annual gross income, in thousands of dollars, needed to obtain a mortgage loan of \$100,000 at an interest rate of 6%.

(b) $f^{-1}(75)$ represents the size of a mortgage loan, in thousands of dollars, that someone with an annual gross income of \$75,000 can afford.

15. $t = \dfrac{\ln(2)}{\ln(1.02)} \approx 35.0028$

16. $t = \dfrac{\ln(5) - \ln(7)}{\ln(3) - \ln(2)} \approx -0.8298$

17. $t = \dfrac{\ln(12.01) - \ln(5.02)}{\ln(1.04) - \ln(1.03)} \approx 90.2834$

25. **(a)** $f(x) \to \infty$ as $x \to \infty$; $f(x) \to -\infty$ as $x \to \infty$

(b) $f(x) \to -\infty$ as $x \to \infty$; $f(x) \to -\infty$ as $x \to \infty$

(c) $f(x) \to 0$ as $x \to \infty$; $f(x) \to 0$ as $x \to \infty$

(d) $f(x) \to 6$ as $x \to \infty$; $f(x) \to 6$ as $x \to \infty$

26. $10 \cdot 2^x$

27. $0.25\sqrt{x}$

28. $y = -\dfrac{3}{7}x + 3$

29. $y = 4^{x/3}$

30. $y = 3 \cdot 3^{x/5}$

31. $y = -x^2 - 5x$

32. $y = 2\left(\dfrac{1}{2}\right)^{x/2}$

34. $y = k(x+2)(x+1)(x-1)$, where $k > 0$ is a constant

36. $y = 5\sin(\pi x/20)$

37. $y = -k(x+5)(x+1)(x-3)^2$ where $k > 0$ is a constant

38. $y = \dfrac{3x^2}{x^2 - 4}$

42. Yes

43. No

44. **(a)** 1

(b) Does not exist

(c) 1

(d) 0

47. **(a)** -5

(b) -1

(c) Does not exist

(d) Does not exist

48. **(a)** 3

(b) 7

(c) Does not exist

(d) 8

49. Yes

50. Yes

51. No

52. No

64. **(a)** 2

(b) 2

(c) 2

(d) 4/3

67. 10

68. 1/8

69. -1

70. 1/8

71. 9

72. 8

79. 2025

85. 10 hours

87. approximately 14.21 years

92. **(a)** Maximum voltage through the outlet

(b) 1/60 seconds

(c) 60

99. (a) (III)

(b) (IV)

(c) (I)

(d) (II)

101. $k = 20$

102. $k = 1/2$

107. **(b)** No; since g is increasing for all $x < -2$, g must "approach" the horizontal asymptote at $y = 5$ from above. In other words, as $x \to -\infty$, the graph of g must be concave up.

115. $\dfrac{1}{2\sqrt{x}}$

117. 48/7

119. The limit does not exist

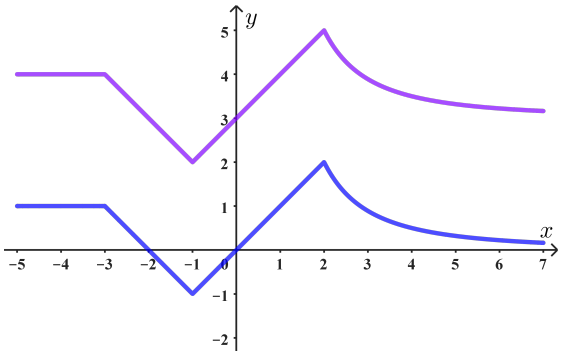
Section 1.1

18. Parallel: $y = -4x + 9$; Perpendicular: $y = \dfrac{1}{4}x + \dfrac{19}{4}$

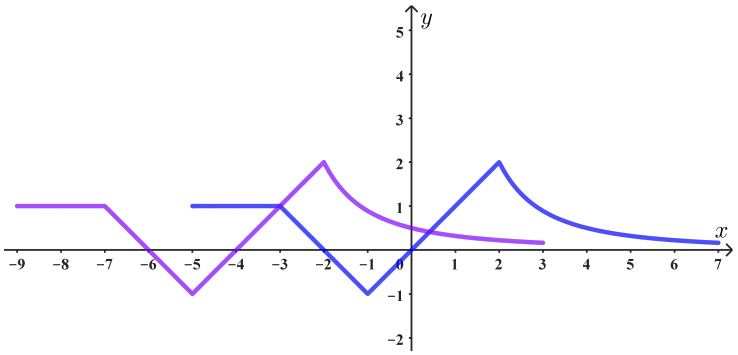
Section 1.3

8. **Note:** In each of the following graphs, f is graphed in blue, while the answer is graphed in purple.

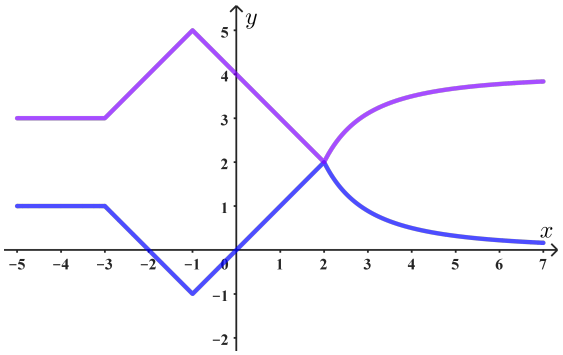
(a)



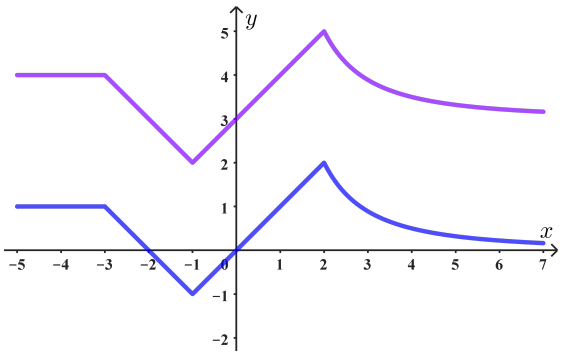
(b)



(c)



(d)



42. $y = (x-2)^3 - 1$

Section 1.4

2. AB

4. $2AB$

6. $2A + 3e\ln(B)$

30. $f^{-1}(t) = 10\ln(t/50)$

Selected Answers for the Additional Review Problems

3. (a) $V(h) = 24h$; (b) $0 < h < \infty$ or $0 \leq h < \infty$ are reasonable domains (why?); using interval notation $(0, \infty)$ or $[0, \infty)$.

5. (a) $y = m(x - x_0) + y_0$; (b) $b = y_0 - mx_0$.

6. (a) $y = -\frac{4}{3}(x + 1) + 6$ or $y = -\frac{4}{3}(x - 5) - 2$; (b) $b = \frac{14}{3}$.

7. (a) $y = 2(x - 5.2) + 12.1$; (b) $b = 1.7$.

8. (a) $y = 5(1.8)^t$; (b) $y = 3(0.25)^t$.

9. $P = 6.7(1.012)^t$; Population about 8.5 billion people in 2027.

10. $y = 8 \cdot 2^t$

12. (a) $f(g(0)) = 5$; (b) $f(g(x)) = (1 + \sqrt{x})^2 + 4$; (c) $g(f(x)) = 1 + \sqrt{x^2 + 1}$; (d) $g(a + h) - g(a) = \sqrt{a + h} - \sqrt{a}$

13. (a) $f(g(0)) = -1$; (b) $f(g(x)) = \dfrac{1}{5x - 1}$; (c) $g(f(x)) = \dfrac{5}{x} - 1$; (d) $g(a + h) - g(a) = \dfrac{1}{a + h} - \dfrac{1}{a}$

14. (a) $\dfrac{f(x + h) - f(x)}{h} = 5 - 2x - h$; (b) $\dfrac{f(x + h) - f(x)}{h} = -\dfrac{h}{x(x + h)}$

15. (a) $x = \dfrac{\log(8)}{5} \approx 0.1806$; (b) $x = 1 + \dfrac{\log(\frac{1}{2})}{\log(3)} = 1 - \dfrac{\log(2)}{\log(3)} \approx 0.3691$; (c) $x = \dfrac{\ln(3)}{\ln(\frac{1}{5})} = -\dfrac{\ln(3)}{\ln(5)} \approx -0.6826$.

16. $t =$ $\approx$ hours

19. (c) sin(4) negative; cos(4) negative

21. $p(x) = \dfrac{1}{9}(x + 3)(x + 1)(x - 3)$

23. (a) 1; (b) 1; (c) 1; (d) -3; (e) 2; (f) does not exist (why?); (g) ∞; (h) 0; (i) does not exist (why?); (j) 0; (k) $-\infty$; (l) 2; (m) 23; (n) 3; (o) -6

24. Numerical evidence suggests $\lim_{x\to 0} \dfrac{e^{4x}-1}{x} = 4$.

25. (a) $\lim_{x\to 0} \dfrac{1}{x^2} = \infty$; $\lim_{x\to\infty} \dfrac{1}{x^2} = 0$; (b) $\lim_{x\to 1} \dfrac{|x-1|}{x-1}$ does not exist (why?); $\lim_{x\to\infty} \dfrac{|x-1|}{x-1} = \infty$

26. (a) 6; (b) 0; (c) 4; (d) $\dfrac{5}{6}$; (e) $\dfrac{1}{8}$; (f) 10.

27. (a) -5; (b) 0; (c) $\dfrac{1}{2}$; (d) 0

30. Note $\lim_{x\to 1} 4x = 4$ and $\lim_{x\to 1}[x^2 + 2x + 1] = 4$. Why can we conclude $\lim_{x\to 1} f(x) = 4$?

31. $k = \dfrac{3}{4}$