Chapter 1 Review Exercises (pp. 56–57)

1. $y = 3(x-1) + (-6)$
   $y = 3x - 9$

4. $m = \dfrac{-2-6}{1-(-3)} = \dfrac{-8}{4} = -2$
   $y = -2(x+3) + 6$
   $y = -2x$

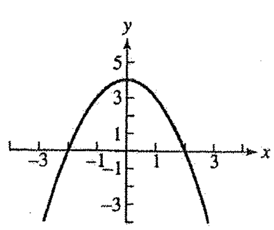
6. $m = \dfrac{5-3}{-2-3} = \dfrac{2}{-5} = -\dfrac{2}{5}$
   $y = -\dfrac{2}{5}(x-3) + 3$
   $y = -\dfrac{2}{5} + \dfrac{21}{5}$

8. Since $2x - y = -2$ is equivalent to $y = 2x + 2$, the slope of the given line (and hence the slope of the desired line) is 2.
   $y = 2(x-3) + 1$
   $y = 2x - 5$

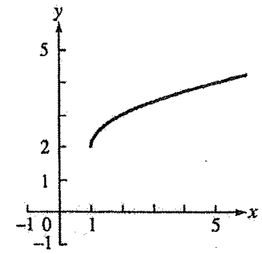
10. Since $3x - 5y = 1$ is equivalent to $y = \dfrac{3}{5}x - \dfrac{1}{5}$, the slope of the given line is $\dfrac{3}{5}$ and the slope of the perpendicular line is $-\dfrac{5}{3}$.
   $y = -\dfrac{5}{3}(x+2) - 3$
   $y = -\dfrac{5}{3}x - \dfrac{19}{3}$

Section 1.2 Exercises

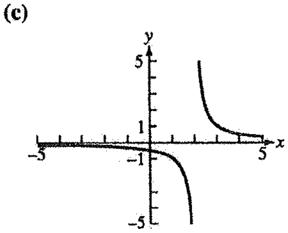
5. **(a)** $(-\infty, \infty)$ or all real numbers
   (b) $(-\infty, 4]$
   (c)



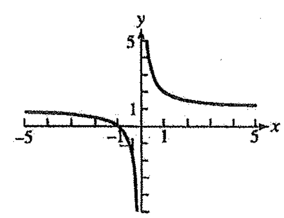
7. **(a)** Since we require $x - 1 \geq 0$, the domain is $[1, \infty)$.
   (b) $[2, \infty)$
   (c)



9. **(a)** Since we require $x - 2 \neq 0$, the domain is $(-\infty, 2) \cup (2, \infty)$.
   (b) Since $\dfrac{1}{x-2}$ can assume any value except 0, the range is $(-\infty, 0) \cup (0, \infty)$.
   (c)



11. **(a)** Since we require $x \neq 0$, the domain is $(-\infty, 0) \cup (0, \infty)$.
   (b) Note that $\dfrac{1}{x}$ can assume any value except 0, so $1 + \dfrac{1}{x}$ can assume any value except 1.
   The range is $(-\infty, 1) \cup (1, \infty)$.
   (c)



22. Neither, since the function is a sum of even and odd powers of x.

24. Even, since the function is a sum of even powers of $x(x^2 - 3x^0)$.

26. Odd, since the function is a sum of odd powers of x.

28. Neither, since, (for example), $y(-2) = 4^{1/3}$ and $y(2) = 0$.

30. Even, since the function involves only even powers of x.

Section 1.5

13. $y = 2x + 3$
$y - 3 = 2x$
$\frac{y-3}{2} = x$

Interchange x and y.

$\frac{x-3}{2} = y$

$f^{-1}(x) = \frac{x-3}{2}.$

Verify.

$$(f \circ f^{-1})(x) = f\left(\frac{x-3}{2}\right) = 2\left(\frac{x-3}{2}\right) + 3 = (x-3) + 3 = x$$

$$(f^{-1} \circ f)(x) = f^{-1}(2x+3) = \frac{(2x+3)-3}{2} = \frac{2x}{2} = x$$

14. $y = 5 - 4x$
$4x = 5 - y$
$x = \frac{5-y}{4}$

Interchange x and y.

$y = \frac{5-x}{4}$

$f^{-1}(x) = \frac{5-x}{4}$

Verify.

$$(f \circ f^{-1})(x) = f\left(\frac{5-x}{4}\right) = 5 - 4\left(\frac{5-x}{4}\right) = 5 - (5-x) = x$$

$$(f^{-1} \circ f)(x) = f^{-1}(5-4x) = \frac{5-(5-4x)}{4} = \frac{4x}{4} = x$$

15. $y = x^3 - 1$
$y + 1 = x^3$
$(y+1)^{1/3} = x$

Interchange x and y.

$(x+1)^{1/3} = y$
$f^{-1}(x) = (x+1)^{1/3}$ or $\sqrt[3]{x+1}$

Verify.

$$(f \circ f^{-1})(x) = f(\sqrt[3]{x+1}) = (\sqrt[3]{x+1})^3 - 1 = (x+1) - 1 = x$$

$$(f^{-1} \circ f)(x) = f^{-1}(x^3 - 1) = \sqrt[3]{(x^3-1)+1} = \sqrt[3]{x^3} = x$$

16. $y = x^2 + 1, x \geq 0$
$y - 1 = x^2, x \geq 0$
$\sqrt{y-1} = x$

Interchange x and y.

$\sqrt{x-1} = y$
$f^{-1}(x) = \sqrt{x-1}$ or $(x-1)^{1/2}$

Verify. For $x \geq 1$ (the domain of f^{-1}),

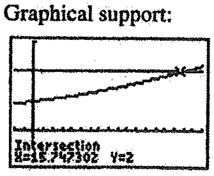
$$(f \circ f^{-1})(x) = f(\sqrt{x-1}) = (\sqrt{x-1})^2 + 1 = (x-1) + 1 = x$$

For $x > 0$, (the domain of f),

$$(f^{-1} \circ f)(x) = f^{-1}(x^2+1) = \sqrt{(x^2+1)-1} = \sqrt{x^2} = |x| = x$$

33. $(1.045)^t = 2$
$\ln(1.045)^t = \ln 2$
$t \ln 1.045 = \ln 2$
$t = \frac{\ln 2}{\ln 1.045} \approx 15.75$

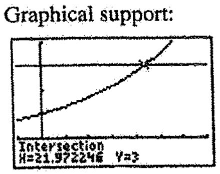
Graphical support:



$[-2, 18]$ by $[-1, 3]$

34. $e^{0.05t} = 3$
$\ln e^{0.05t} = \ln 3$
$0.05t = \ln 3$
$t = \frac{\ln 3}{0.05} = 20 \ln 3 \approx 21.97$

Graphical support:



$[-5, 35]$ by $[-1, 4]$

Section 1.6

17. **(a)** Period $= \frac{2\pi}{2} = \pi$

(b) Amplitude = 1.5

(c) $[-2\pi, 2\pi]$ by $[-2, 2]$

18. **(a)** Period $= \frac{2\pi}{3}$

(b) Amplitude = 2

(c) $\left[-\frac{2\pi}{3}, \frac{2\pi}{3}\right]$ by $[-4, 4]$

19. **(a)** Period $= \frac{2\pi}{2} = \pi$

(b) Amplitude = 3

(c) $[-2\pi, 2\pi]$ by $[-4, 4]$

20. **(a)** Period $= \frac{2\pi}{1/2} = 4\pi$

(b) Amplitude = 5

(c) $[-4\pi, 4\pi]$ by $[-10, 10]$

21. **(a)** Period $= \frac{2\pi}{\pi/3} = 6$

(b) Amplitude = 4

(c) $[-3, 3]$ by $[-5, 5]$

22. **(a)** Period $= \frac{2\pi}{\pi} = 2$

(b) Amplitude = 1

(c) $[-4, 4]$ by $[-2, 2]$