Section 1.1

2. \( f \) and \( g \) are not equal because \( f(1) \) is undefined and \( g(1) = 1 \).

4. (a). The point \((-4, -2)\) is on the graph of \( f \), so \( f(-4) = -2 \). The point \((3, 4)\) is on the graph of \( g \), so \( g(3) = 4 \).

(b). We are looking for the values of \( x \) for which the \( y \) values are equal. The \( y \) values for \( f \) and \( g \) are equal at the points \((-2, 1)\) and \((2, 2)\), so the desired values of \( x \) are \(-2 \) and \( 2 \).

(c). \( f(x) = -1 \) is equivalent to \( y = -1 \). When \( y = -1 \), we have \( x = -3 \) and \( x = 4 \).

(d). As \( x \) increases from 0 to 4, \( y \) decreases from 3 to \(-1 \). Thus, \( f \) is decreasing on the interval \([0, 4]\).

(e). The domain of \( f \) consists of all \( x \)-values on the graph of \( f \). For this function, the domain is \(-4 \leq x \leq 4 \). The range of \( f \) consists of all \( y \)-values on the graph of \( f \). For this function, the range is \(-2 \leq y \leq 3 \).

(f). The domain of \( g \) is \([-4, 3]\) and the range is \([0.5, 4]\).

31. \( f(x) = \frac{x + 4}{x^2 - 9} \) is defined for all \( x \) except when \( x = x^2 - 9 \Leftrightarrow 0 = (x + 3)(x - 2) \Leftrightarrow x = -3, 3 \), so the domain is all real numbers except \( x = -3, 3 \) or \((-\infty, -3) \cup (-3, 3) \cup (3, \infty)\).

33. All real numbers.

Section 1.2

1. (a) logarithmic, (b) root function, (c) rational, (d) quadratic, (e) exponential, (f) trigonometric

3. (a) \( g \) and \( h \) are even functions (symmetric with respect to the \( y \)-axis) and \( f \) is an odd function (symmetric with respect to the origin). So (b) \([y = x^5]\) must be \( f \). Since \( g \) is flatter than \( h \) near the origin we must be (c) \([y = x^8]\) matched with \( g \) and (a) \([y = x^2]\) matched with \( h \).

Section 1.3

3. (a). (graph 3) The graph of \( f \) is shifted 4 units to the right and has equation \( y = f(x - 4) \).

(b). (graph 1) The graph of \( f \) is shifted 3 units upward and has equation \( y = f(x) + 3 \).

(c). (graph 4) The graph of \( f \) is shrunk vertically by a factor of 3 and has equation \( f(x) = \frac{1}{3} f(x) \).
(d). (graph 5) The graph of \( f \) is shifted 4 units to the left and reflected about the \( x \)-axis. Its equation is \( y = f(x + 4) \).

(e). (graph 2) The graph of \( f \) is shifted 6 units to the left and stretched vertically by a factor of 2. Its equation is \( y = 2f(x + 6) \).

9. \( y = -x^2 \) is a reflection about the \( x \)-axis. Use desmos to visualize plots.

19. Strecth \( y = \sin(x) \) horizontally by a factor of 2.

53. (a). \( g(2) = 5 \) so \( f(g(2)) = f(5) = 4 \)
   (b). \( g(f(0)) = g(0) = 3 \).
   (c). \( f(g(0)) = f(3) = 0 \)
   (d). \( g(f(6)) = g(6) \). This value is not defined.
   (e). \( g(g(-2)) = 4 \).
   (f). \( f(f(4)) = -2 \).

Section 1.4

(1a). 4

(4a). \( x^{4n-3} \).

Section 1.5

(21). \( f^{-1}(x) = \frac{1}{4}(x - 1)^2 - \frac{2}{3} \)

(51a). \( x = \frac{1}{4}(7 - \ln 6) \)