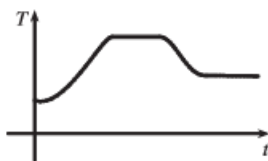


2. (a) The point $(-4, -2)$ is on the graph of f , so $f(-4) = -2$. The point $(3, 4)$ is on the graph of g , so $g(3) = 4$.
 (b) We are looking for the values of x for which the y -values are equal. The y -values for f and g are equal at the points $(-2, 1)$ and $(2, 2)$, so the desired values of x 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 $-4 \leq x \leq 4$, or $[-4, 4]$. The range of f consists of all y -values on the graph of f . For this function, the range is $-2 \leq y \leq 3$, or $[-2, 3]$.
 (f) The domain of g is $[-4, 3]$ and the range is $[0.5, 4]$.

14. The temperature of the pie would increase rapidly, level off to oven temperature, decrease rapidly, and then level off to room temperature.



17. $f(x) = 3x^2 - x + 2$.

$$f(2) = 3(2)^2 - 2 + 2 = 12 - 2 + 2 = 12.$$

$$f(-2) = 3(-2)^2 - (-2) + 2 = 12 + 2 + 2 = 16.$$

$$f(a) = 3a^2 - a + 2.$$

$$f(-a) = 3(-a)^2 - (-a) + 2 = 3a^2 + a + 2.$$

$$f(a+1) = 3(a+1)^2 - (a+1) + 2 = 3(a^2 + 2a + 1) - a - 1 + 2 = 3a^2 + 6a + 3 - a - 1 + 2 = 3a^2 + 5a + 4.$$

$$2f(a) = 2 \cdot f(a) = 2(3a^2 - a + 2) = 6a^2 - 2a + 4.$$

$$f(2a) = 3(2a)^2 - (2a) + 2 = 3(4a^2) - 2a + 2 = 12a^2 - 2a + 2.$$

$$f(a^2) = 3(a^2)^2 - (a^2) + 2 = 3(a^4) - a^2 + 2 = 3a^4 - a^2 + 2.$$

$$[f(a)]^2 = [3a^2 - a + 2]^2 = (3a^2 - a + 2)(3a^2 - a + 2)$$

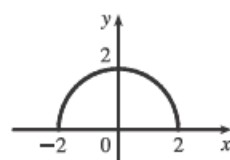
$$= 9a^4 - 3a^3 + 6a^2 - 3a^3 + a^2 - 2a + 6a^2 - 2a + 4 = 9a^4 - 6a^3 + 13a^2 - 4a + 4.$$

$$f(a+h) = 3(a+h)^2 - (a+h) + 2 = 3(a^2 + 2ah + h^2) - a - h + 2 = 3a^2 + 6ah + 3h^2 - a - h + 2.$$

21.
$$\frac{f(x) - f(a)}{x - a} = \frac{\frac{1}{x} - \frac{1}{a}}{x - a} = \frac{\frac{a - x}{xa}}{x - a} = \frac{a - x}{xa(x - a)} = \frac{-1(x - a)}{xa(x - a)} = -\frac{1}{ax}$$

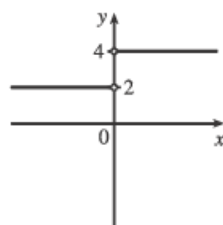
26. $g(u) = \sqrt{u} + \sqrt{4 - u}$ is defined when $u \geq 0$ and $4 - u \geq 0 \Leftrightarrow u \leq 4$. Thus, the domain is $0 \leq u \leq 4 = [0, 4]$.

28. $h(x) = \sqrt{4-x^2}$. Now $y = \sqrt{4-x^2} \Rightarrow y^2 = 4-x^2 \Leftrightarrow x^2 + y^2 = 4$, so the graph is the top half of a circle of radius 2 with center at the origin. The domain is $\{x \mid 4-x^2 \geq 0\} = \{x \mid 4 \geq x^2\} = \{x \mid 2 \geq |x|\} = [-2, 2]$. From the graph, the range is $0 \leq y \leq 2$, or $[0, 2]$.



35. $G(x) = \frac{3x+|x|}{x}$. Since $|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$, we have

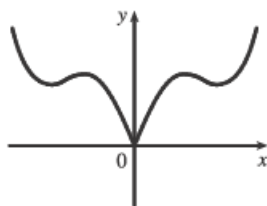
$$G(x) = \begin{cases} \frac{3x+x}{x} & \text{if } x > 0 \\ \frac{3x-x}{x} & \text{if } x < 0 \end{cases} = \begin{cases} \frac{4x}{x} & \text{if } x > 0 \\ \frac{2x}{x} & \text{if } x < 0 \end{cases} = \begin{cases} 4 & \text{if } x > 0 \\ 2 & \text{if } x < 0 \end{cases}$$



Note that G is not defined for $x = 0$. The domain is $(-\infty, 0) \cup (0, \infty)$.

49. Let each side of the base of the box have length x , and let the height of the box be h . Since the volume is 2, we know that $2 = hx^2$, so that $h = 2/x^2$, and the surface area is $S = x^2 + 4xh$. Thus, $S(x) = x^2 + 4x(2/x^2) = x^2 + (8/x)$, with domain $x > 0$.

56. (a) If f is even, we get the rest of the graph by reflecting about the y -axis.



- (b) If f is odd, we get the rest of the graph by rotating 180° about the origin.

