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 $-4\le x\le 4$, or $[-4,4]$. The range of f consists of all y-values on the graph of f. For this function, the range is $-2\le y\le 3$, or $[-2,3]$.

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

5. No, the curve is not the graph of a function because a vertical line intersects the curve more than once. Hence, the curve fails the Vertical Line Test.

6. Yes, the curve is the graph of a function because it passes the Vertical Line Test. The domain is $[-2,2]$ and the range is $[-1,2]$.

7. Yes, the curve is the graph of a function because it passes the Vertical Line Test. The domain is $[-3,2]$ and the range is $[-3,-2)\cup[-1,3]$.

10. First, the tub was filled with water to a height of 15 in. Then a person got into the tub, raising the water level to 20 in. At around 12 minutes, the person stood up in the tub but then immediately sat down. Finally, at around 17 minutes, the person got out of the tub, and then drained the water.

28. $$\frac{f(x)-f(1)}{x-1}=\frac{\dfrac{x+3}{x+1}-2}{x-1}=\frac{\dfrac{x+3-2(x+1)}{x+1}}{x-1}=\frac{x+3-2x-2}{(x+1)(x-1)}$$
$$=\frac{-x+1}{(x+1)(x-1)}=\frac{-(x-1)}{(x+1)(x-1)}=-\frac{1}{x+1}$$

48. The slope of the line segment joining the points $(-5,10)$ and $(7,-10)$ is $\dfrac{-10-10}{7-(-5)}=-\dfrac{5}{3}$, so an equation is

$y-10=-\frac{5}{3}[x-(-5)]$. The function is $f(x)=-\frac{5}{3}x+\frac{5}{3}$, $-5\le x\le 7$.

58. The area of the window is $A = xh + \frac{1}{2}\pi\left(\frac{1}{2}x\right)^2 = xh + \dfrac{\pi x^2}{8}$, where h is the height of the rectangular portion of the window.

The perimeter is $P = 2h + x + \frac{1}{2}\pi x = 30 \quad\Leftrightarrow\quad 2h = 30 - x - \frac{1}{2}\pi x \quad\Leftrightarrow\quad h = \frac{1}{4}(60 - 2x - \pi x)$. Thus,

$$A(x) = x\,\frac{60 - 2x - \pi x}{4} + \frac{\pi x^2}{8} = 15x - \tfrac{1}{2}x^2 - \tfrac{\pi}{4}x^2 + \tfrac{\pi}{8}x^2 = 15x - \tfrac{4}{8}x^2 - \tfrac{\pi}{8}x^2 = 15x - x^2\left(\frac{\pi + 4}{8}\right).$$

Since the lengths x and h must be positive quantities, we have $x > 0$ and $h > 0$. For $h > 0$, we have $2h > 0 \quad\Leftrightarrow$

$30 - x - \frac{1}{2}\pi x > 0 \quad\Leftrightarrow\quad 60 > 2x + \pi x \quad\Leftrightarrow\quad x < \dfrac{60}{2+\pi}$. Hence, the domain of A is $0 < x < \dfrac{60}{2+\pi}$.

1. (a) $f(x) = \log_2 x$ is a logarithmic function.

(b) $g(x) = \sqrt[4]{x}$ is a root function with $n = 4$.

(c) $h(x) = \dfrac{2x^3}{1 - x^2}$ is a rational function because it is a ratio of polynomials.

(d) $u(t) = 1 - 1.1t + 2.54t^2$ is a polynomial of degree 2 (also called a *quadratic function*).

(e) $v(t) = 5^t$ is an exponential function.

(f) $w(\theta) = \sin\theta\,\cos^2\theta$ is a trigonometric function.

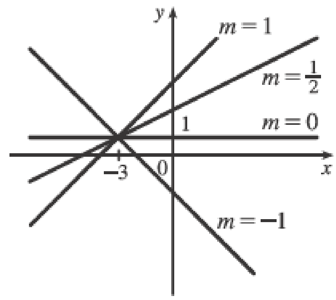
4. (a) The graph of $y = 3x$ is a line (choice G).

(b) $y = 3^x$ is an exponential function (choice f).

(c) $y = x^3$ is an odd polynomial function or power function (choice F).

(d) $y = \sqrt[3]{x} = x^{1/3}$ is a root function (choice g).

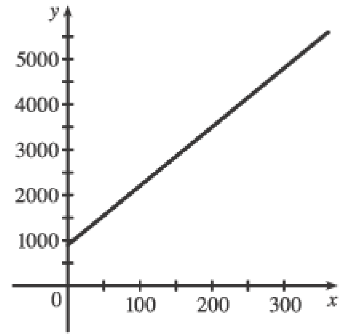
6. All members of the family of linear functions $f(x) = 1 + m(x+3)$ have graphs that are lines passing through the point $(-3, 1)$.



10. (a) For $T = 0.02t + 8.50$, the slope is 0.02, which means that the average surface temperature of the world is increasing at a rate of $0.02\,^\circ\mathrm{C}$ per year. The T-intercept is 8.50, which represents the average surface temperature in $^\circ\mathrm{C}$ in the year 1900.

(b) $t = 2100 - 1900 = 200 \quad\Rightarrow\quad T = 0.02(200) + 8.50 = 12.50\,^\circ\mathrm{C}$

16. (a) Let x denote the number of chairs produced in one day and y the associated cost. Using the points $(100, 2200)$ and $(300, 4800)$, we get the slope $\frac{4800-2200}{300-100} = \frac{2600}{200} = 13$. So $y - 2200 = 13(x - 100) \quad \Leftrightarrow$ $y = 13x + 900$.



(b) The slope of the line in part (a) is 13 and it represents the cost (in dollars) of producing each additional chair.

(c) The y-intercept is 900 and it represents the fixed daily costs of operating the factory.

19. (a) The data appear to be periodic and a sine or cosine function would make the best model. A model of the form $f(x) = a\cos(bx) + c$ seems appropriate.

(b) The data appear to be decreasing in a linear fashion. A model of the form $f(x) = mx + b$ seems appropriate.