Exercises

1. **Natural Domain I.** Find the natural domain of the function
$$f(x) = \frac{8x}{(x-1)(x-2)}.$$

2. **Natural Domain II.** Find the natural domain of the function
$$f(x) = \frac{\sqrt{2x+1}}{\sqrt{1-x}}.$$

3. **Reading a Graph.** Let f be a function whose graph has the following properties: it passes through the points
$$(0,1), \qquad (2,3), \qquad (7,-1),$$
it crosses the x-axis at
$$x = -1, \qquad x = 5, \qquad x = 9,$$
it lies below the x-axis for $x < -1$ and for $5 < x < 9$, and it lies above the x-axis for $-1 < x < 5$ and for $x > 9$. Assume also that the greatest value attained by f is 3 and the least value attained by f is -1.
   (a) Find $f(0)$ and $f(7)$.
   (b) Find $f(2)$ and $f(-1)$.
   (c) Is $f(4)$ positive or negative?
   (d) Is $f(6)$ positive or negative?
   (e) What is the range of f?
   (f) For what values of x is $f(x) = 0$?
   (g) For what values of x is $f(x) \leq 0$?
   (h) For what values of x is $f(x) \geq 0$?

4. **A Point on a Graph.** Determine whether the point $(-2, 12)$ lies on the graph of the function
$$f(x) = x(5+x)(4-x).$$

5. **A Point of the Form $(2+h, f(2+h))$.** Sketch a possible graph of a function $y = f(x)$ with the number 2 marked on the x-axis. Let h represent a positive number and label a possible location of the number $2+h$. Plot the point on the graph whose first coordinate is $2+h$, and label the point with its coordinates.

6. **A Point of the Form $(a+h, f(a+h))$.** Sketch a possible graph of a function $y = f(x)$ with the number a marked on the x-axis. Let h represent a negative number and label a possible location of the number $a+h$. Plot the point on the graph whose first coordinate is $a+h$, and label the point with its coordinates.