1.2 Relations and Functions

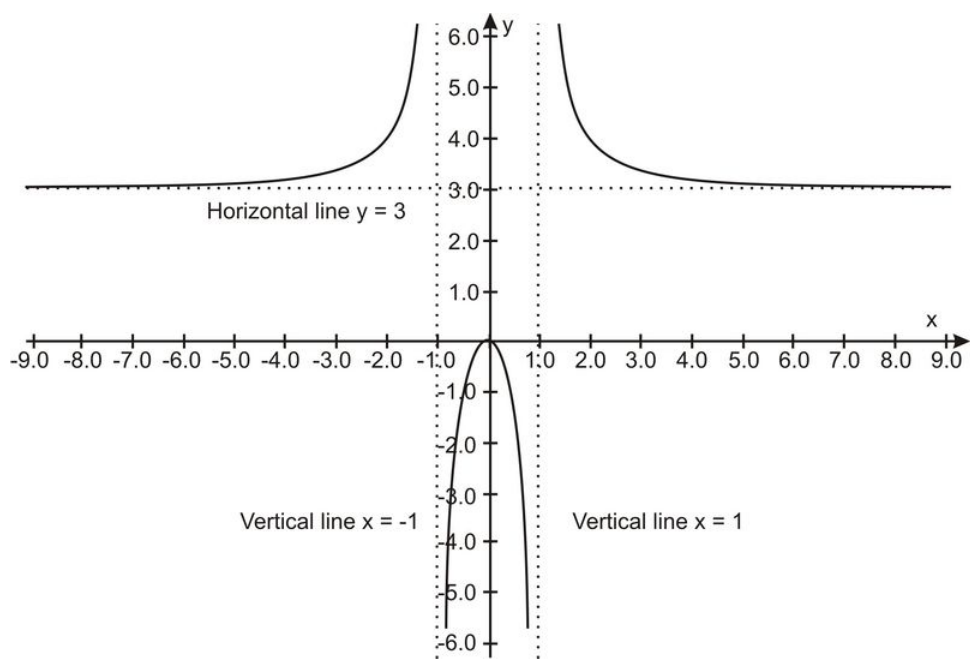
1. Apply the vertical line test to the graph of the relationship shown. The graph gives a function. The domain is the set of all real numbers, or $(-\infty, \infty)$. The range is $\{-2 \le y \le 2\}$.

2. A vertical line can cross the graph in more than one place. The graph is not a function.

3. The function is a rational function. Set the denominator $= 0$ and solve for x.

$$\begin{aligned} x^2 - 1 &= 0 \\ (x-1)(x+1) &= 0 \\ x &= 1 \text{ or } x = -1 \end{aligned}$$

The domain is $\{x \neq -1, 1\}$. Graph the function on your graphing calculator.



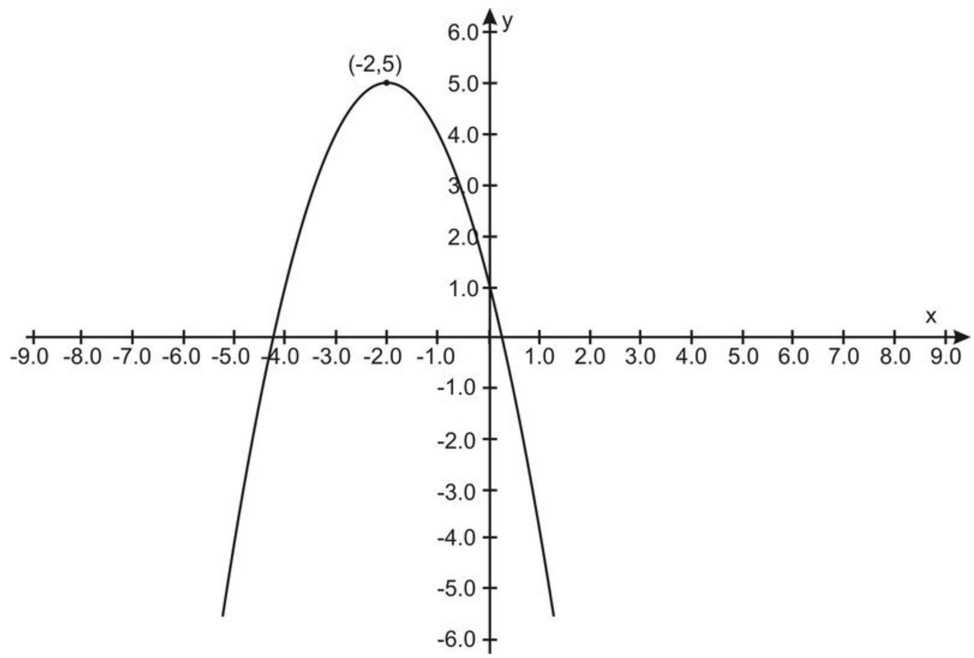
The range is $\{y > 3\} \cup \{y < 0\}$.

4. Looking at the graph, the domain is $\{x < 3\}$ and the range is $\{y \ge 0\}$.

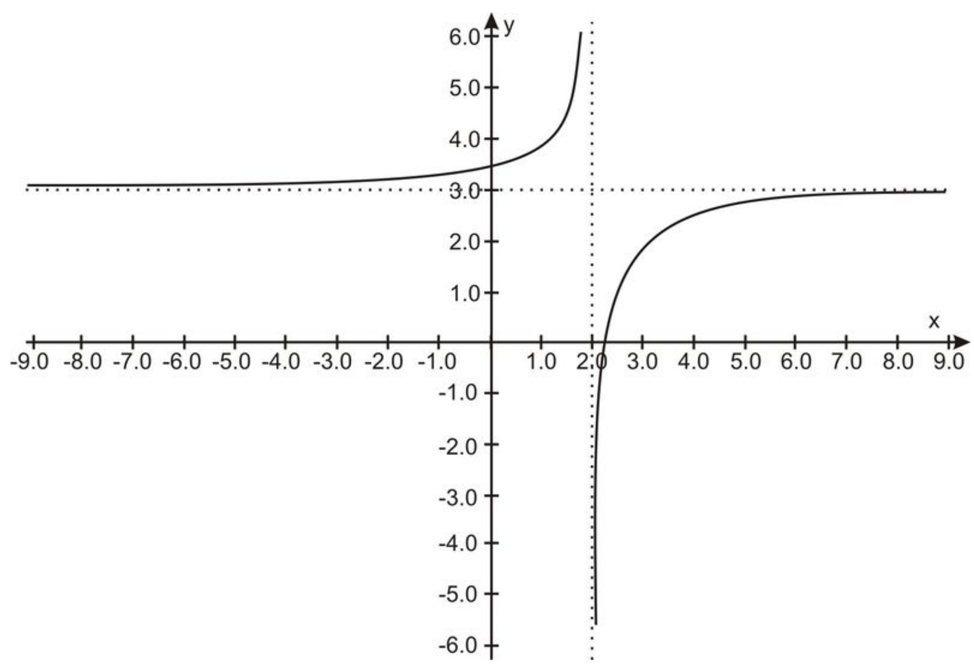
5. $f(x) = |2x - 3| - 2 = |x - \frac{3}{2}| - 2$.

The graph shows the absolute value function $\frac{3}{2}$ units to the right and two units down. The domain is the set of all real numbers, or $(-\infty, \infty)$. The range is $\{y \ge -2\}$.

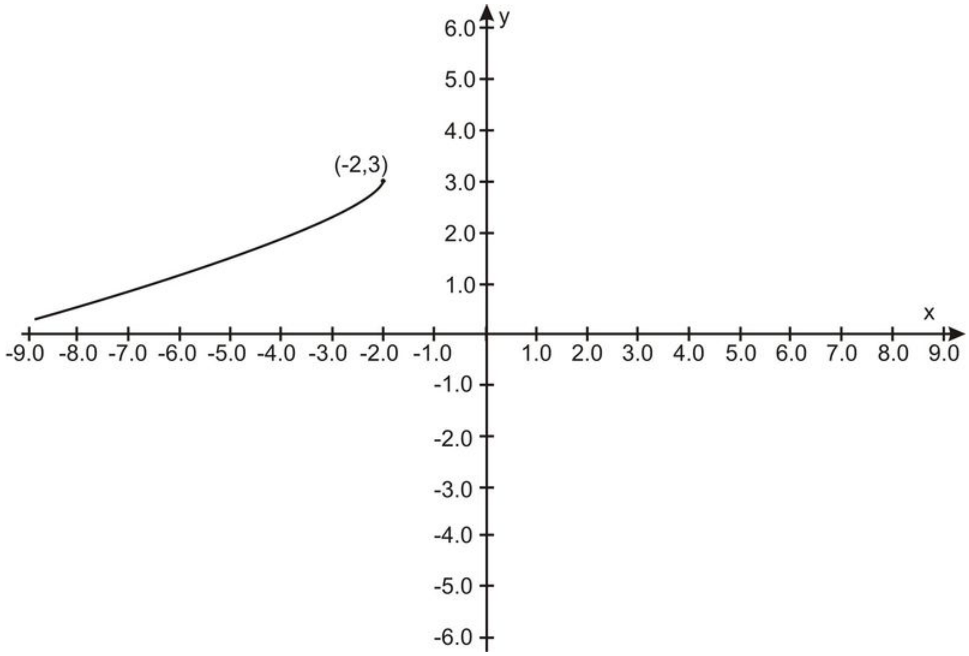
6. This function is the basic quadratic function shifted 2 units left and 5 units up and then flipped.



7. This function is the basic function $f(x) = \frac{1}{x}$ shifted 2 units right and 3 units up and then flipped.



8. $f(x) = -\sqrt{-x-2}+3 = -\sqrt{-(x+2)}+3$. This function is the basic function $f(x) = \sqrt{x}$. Note that there is a negative sign in front of the x. The new function becomes $f(x) = \sqrt{-x}$ and the graph of this function is a reflection of $f(x) = \sqrt{x}$ around the $y-$axis. Then the function is shifted 2 units left and 3 units up. It is then flipped upside down.



9. $(f\ o\ g)(x) = f(g(x)) = -3\left(\sqrt{x}\right) + 2;\ (gof)(x) = g(f(x)) = \sqrt{-3x+2}$

10. $(f\ o\ g)(x) = f(g(x)) = \left(\sqrt{x}\right)^2 = x;\ (gof)(x) = g(f(x)) = \sqrt{x^2} = x$