Example

Find the domain of the given function.

1. \( f(x) = \frac{2}{3x} \)

**Answer:** \((-\infty, 0) \cup (0, \infty)\)

Division by zero occurs when the denominator is zero, which is when \(3x = 0\). This happens when \(x = 0\). Any other value of \(x\) is allowed.

2. \( g(x) = \frac{x - 2}{x^2 - 1} \)

**Answer:** \((-\infty, -1) \cup (-1, 1) \cup (1, \infty)\)

Division by zero occurs when the denominator is zero, which is when \(x^2 - 1 = 0\). This happens when \(x = \pm 1\). Any other value of \(x\) is allowed (including values BETWEEN \(-1\) and \(1\)).

3. \( h(x) = \frac{1}{\frac{2}{x} - 1} \)

**Answer:** \((-\infty, 0) \cup (0, 2) \cup (2, \infty)\)

There are two denominators to worry about here – there is the “big” denominator \(\frac{2}{x} - 1\), and inside of that is another denominator, which is just \(x\). Neither of these denominators can be zero. The “big” denominator \(\frac{2}{x} - 1\) is zero when \(x = 2\). The other denominator is just \(x\), so this denominator is zero when \(x = 0\). This tells us that \(x\) cannot equal 0 or 2, but all other values are allowed.

4. \( k(x) = \sqrt{x - 2} \)

**Answer:** \([2, \infty)\)

Anything we take a square root of must be positive or zero. This means \(x - 2 \geq 0\), which tells us \(x \geq 2\).