

3) Find the value(s) of x where this function will not be continuous.

$$f(x) = \begin{cases} \frac{16x}{x^2-9} & \text{if } x < 1 \\ 5x-6 & \text{if } x \geq 1 \end{cases}$$

The bottom piece is a line and thus is continuous. The top piece of the function is undefined at $x=3$ and $x=-3$. However, the value of $x=3$ is actually used for the second piece of the function and thus not a problem with the function $f(x)$.

Now check to see if the two pieces meet up.

$$\lim_{x \rightarrow 1^-} f(x) = \lim_{x \rightarrow 1^-} \frac{16x}{x^2-9} = \frac{16}{-8} = -2$$

$$\lim_{x \rightarrow 1^+} f(x) = \lim_{x \rightarrow 1^+} 5x-6 = 5-6 = -1$$

Since the left and right limits are not equal, the function is not continuous at $x=1$.

Answer: $f(x)$ is not continuous for $x=1$ and $x=-3$.