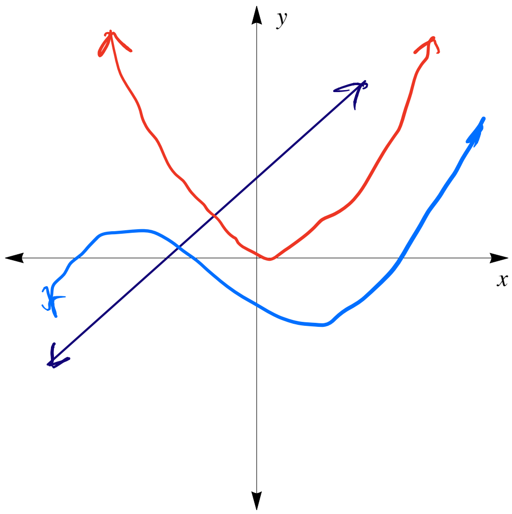
Continuity 2: Intuitive Notion of Continuity

An informal definition of a continuous function:

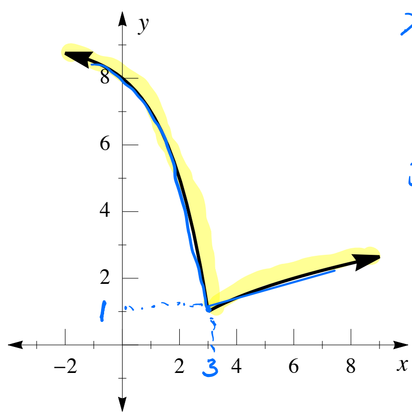
A function is continuous if the graph of the function can be drawn without lifting your pencil from the paper.

1. Using the template below, graph what you think might be one or two different continuous functions.



2. Below is piecewise function (made from two non-linear pieces) that appears to be continuous at $x = 3$. How can we determine that the function is continuous at $x = 3$?

$$f(x) = \begin{cases} 9 - 2^x & x \le 3 \\ \sqrt{x-2} & x > 3 \end{cases}$$



$x = 3 : \; 9 - 2^x$

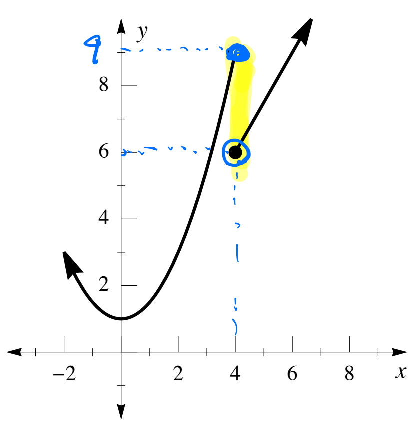
$9 - 2^3 = 9 - 8 = 1$

$x = 3 : \; \sqrt{x-2}$

$\sqrt{3-2} = \sqrt{1} = 1$

3. When the values of the function are not connected, we say that the function is **not continuous**. Use the equation of the following piecewise function to confirm that the graph is correct and that the function is not continuous at $x = 4$.

$$g(x) = \begin{cases} 0.5x^2 + 1 & x \le 4 \\ 1.5x & x > 4 \end{cases}$$



$x = 4 \quad 0.5(4)^2 + 1$

$0.5 \cdot 16 + 1$

9

$x = 4 \quad 1.5(4) = 6$

$9 \ne 6$

Not Continuous at $x = 4$

[Challenge] It is important to know that polynomial, rational, power, exponential, logarithmic, and trigonometric functions are continuous at all points **in their domains**. (We'll be looking closer at this soon).