

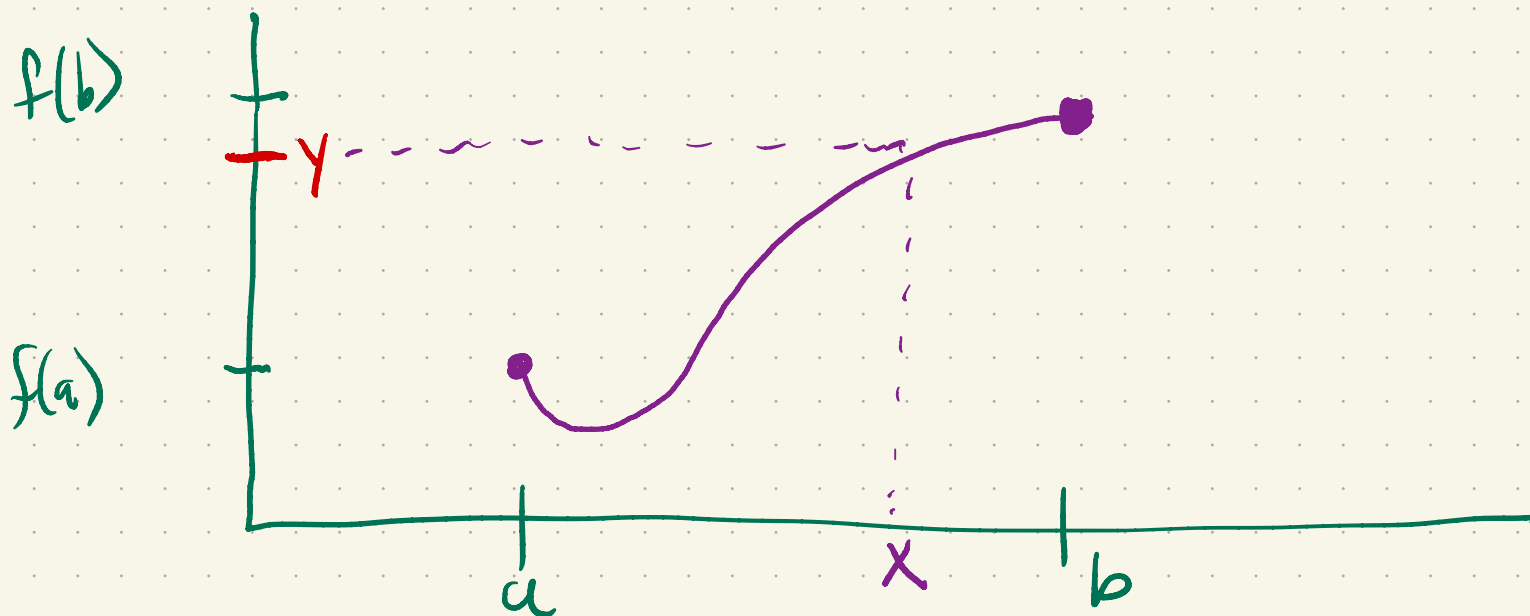
Intermediate Value Theorem

If $f(x)$ is continuous on $[a, b]$

and if y is a number between $f(a)$ and $f(b)$

then there exists x in $[a, b]$ where

$$f(x) = y.$$



Continuity:

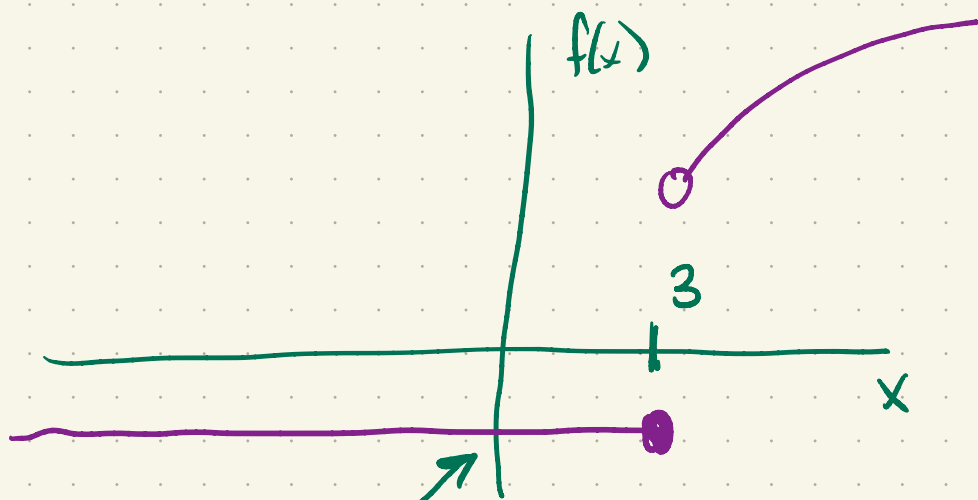
algebraic:

$$\lim_{x \rightarrow a} f(x) = f(a)$$

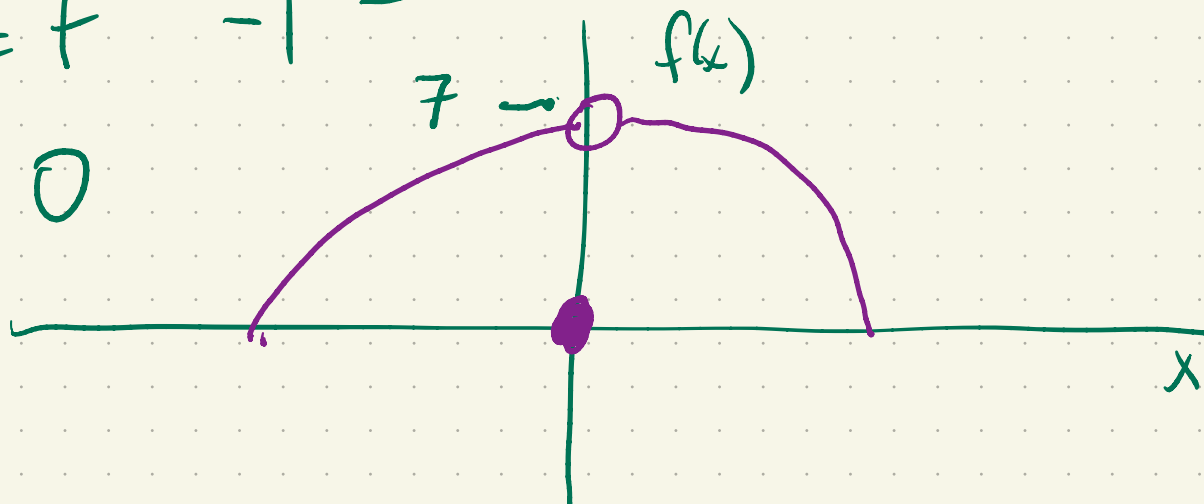
graphical

not continuous
at $x=3$

$$\lim_{x \rightarrow 3} f(x) = f(3)$$
$$\text{DNE} = -1$$



$$\lim_{x \rightarrow 0} f(x) = 7$$
$$f(0) = 0$$



not continuous at
 $x=0$

Is there an x such that

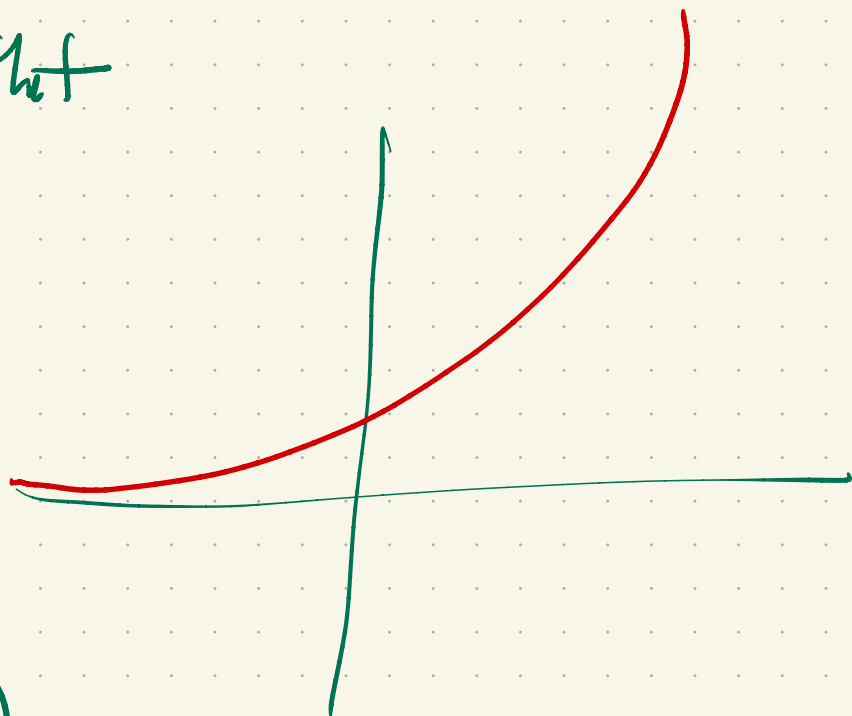
$$e^x - 4x = 0$$

$$e^x = 4x$$

$$\ln(e^x) = \ln(4x)$$

$$x = \ln(4) + \ln(x)$$

$$e^x = 4x$$



$$f(x) = e^x - 4x$$

$$f(0) = e^0 - 4 \cdot 0 = 1 - 0 = 1$$

$$f(1) = e^1 - 4 \cdot 1 = e - 4 \approx 2.7 - 4 < 0$$

