

Continuity and Differentiability

A function must be continuous in order to be differentiable. To prove continuity, prove that

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

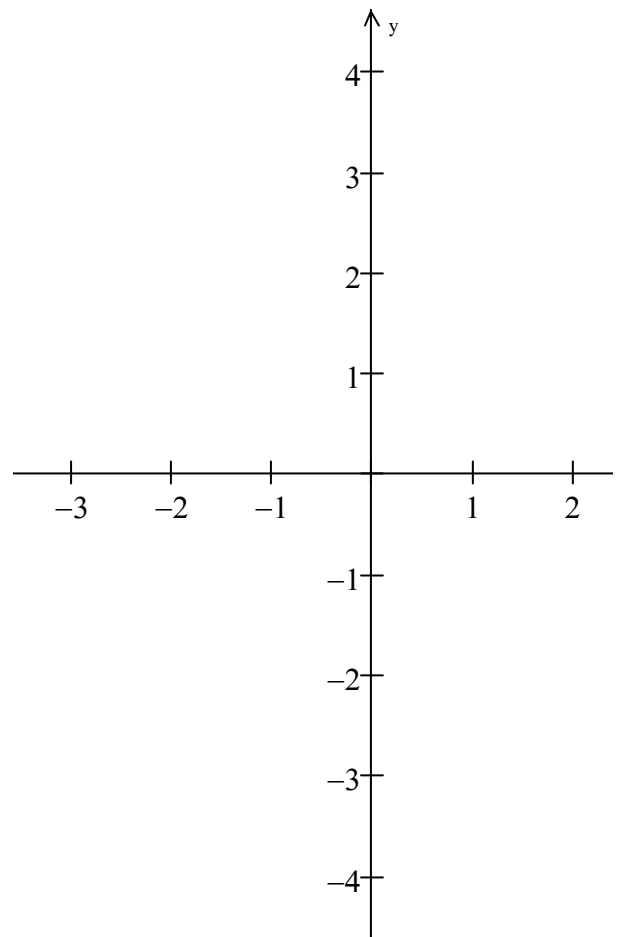
To prove differentiability, prove that

$$\lim_{x \rightarrow a^-} f'(x) = \lim_{x \rightarrow a^+} f'(x)$$

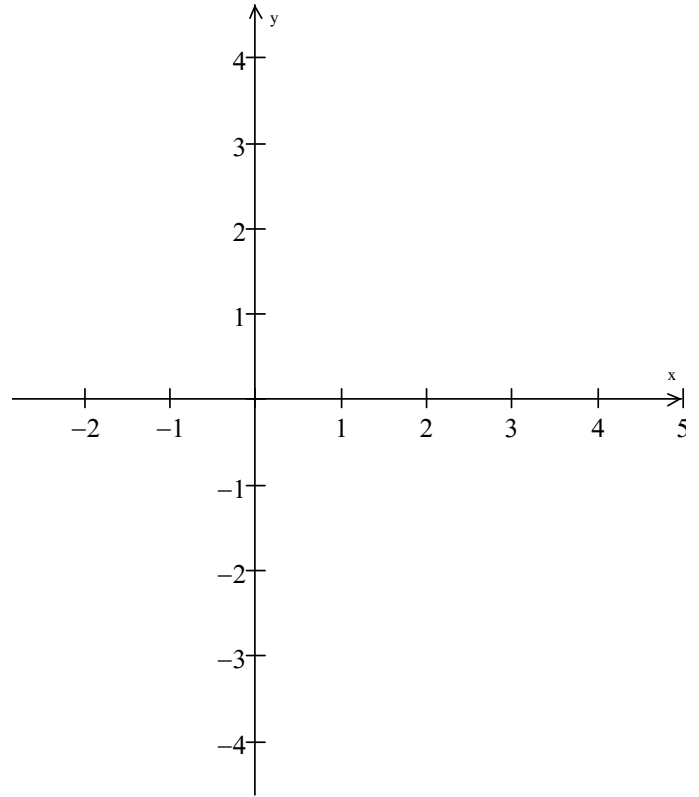
Remember that in the case of both limits, in order to exist the limit must be the same from the left side as from the right side.

Determine what values of x for which the function is continuous and differentiable. Then graph the function on the axes provided

$$1. f(x) = \begin{cases} 3x^2 - 5, & x \leq -1 \\ 2x^3, & x > -1 \end{cases}$$



$$2. g(x) = \begin{cases} x^2 - 2x - 3, & x \leq 2 \\ 2x - 7, & x > 2 \end{cases}$$



$$3. h(x) = \begin{cases} \cos(x), & x < 0 \\ x^2, & x \geq 0 \end{cases}$$

