

Example:

$$\text{Evaluate } \lim_{x \rightarrow 3} \frac{x^2 - 2x - 3}{x^2 - 5x + 6} = \left(\frac{0}{0}\right)$$

$$= \lim_{\substack{x \rightarrow 3 \\ x \neq 3}} \frac{\cancel{(x-3)}(x+1)}{\cancel{(x-3)}(x-2)} = \lim_{x \rightarrow 3} \frac{x+1}{x-2}$$

$$= \frac{3+1}{3-2} = \frac{4}{1} = 4$$

Example:

$$\lim_{x \rightarrow 0} \frac{x}{\sqrt{1+x^2} - 1} = \left(\frac{0}{0}\right)$$

$$= \lim_{x \rightarrow 0} \frac{x}{\sqrt{1+x^2} - 1} \cdot \frac{\sqrt{1+x^2} + 1}{\sqrt{1+x^2} + 1}$$

$$= \lim_{x \rightarrow 0} \frac{x(\sqrt{1+x^2} + 1)}{(\sqrt{1+x^2})^2 - (1)^2} = \lim_{x \rightarrow 0} \frac{x(\sqrt{1+x^2} + 1)}{1+x^2 - 1}$$

$$= \lim_{x \rightarrow 0} \frac{\cancel{x}(\sqrt{1+x^2} + 1)}{\cancel{x}}$$

$$= \lim_{x \rightarrow 0} (\sqrt{1+x^2} + 1)$$

$$= \sqrt{1+0^2} + 1$$

$$= 1 + 1 = 2$$