

Name: _____

Date: _____

Learning Goal 4.2

The Mean Value Theorem and L'Hospital's Rule

Let's recall limits! Our favourite type?

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{0}{0}$$

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{\pm\infty}{\pm\infty}$$

Instead of approaching this with a lot of algebra, we now have the skills to do something a little easier!

L'Hospital's Rule

Suppose f and g are differentiable and $g'(x) \neq 0$ near a (except possibly at a). If

$$\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$$

is indeterminate, then

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

(if the limit on the right side exists). Check the criteria carefully!

Example Evaluate.

a. $\lim_{x \rightarrow 1} \frac{\ln x}{x - 1}$

b. $\lim_{x \rightarrow \infty} \frac{e^x}{x^2}$

c.
$$\lim_{x \rightarrow \infty} \frac{\ln x}{\sqrt[3]{x}}$$

d.
$$\lim_{x \rightarrow 0} \frac{\tan x - x}{x^3}$$