

MAT 136 (Calculus I) Prof. Swift
In-Class Worksheet: L'Hospital's Rule

Consider $\lim_{x \rightarrow 1} \frac{x-1}{x^2+2x-3}$.

1. Show that the limit is an indeterminate form of type $\frac{0}{0}$.
2. Note that $\frac{0}{0}$ is undefined. Does this mean that $\lim_{x \rightarrow 1} \frac{x-1}{x^2+2x-3}$ does not exist?
3. Evaluate the limit using L'Hospital's rule.
4. Evaluate the limit by factoring, like we did in Exam 1.

1. $\lim_{x \rightarrow 1} x-1 = 1-1=0$ and $\lim_{x \rightarrow 1} x^2+2x-3 = 1^2+2 \cdot 1-3=0$.

2. No.

3. $\lim_{x \rightarrow 1} \frac{x-1}{x^2+2x-3} \stackrel{\text{L'H}}{=} \lim_{x \rightarrow 1} \frac{\frac{d}{dx}[x-1]}{\frac{d}{dx}[x^2+2x-3]} = \lim_{x \rightarrow 1} \frac{1}{2x+2} = \frac{1}{2 \cdot 1+2} = \boxed{\frac{1}{4}}$
type $\frac{0}{0}$

4. $\lim_{x \rightarrow 1} \frac{x-1}{x^2+2x-3} = \lim_{x \rightarrow 1} \frac{x-1}{(x-1)(x+3)} = \lim_{x \rightarrow 1} \frac{1}{x+3} = \frac{1}{1+3} = \boxed{\frac{1}{4}}$.