DATE: _____

L'Hôpital's Rule

Evaluate each limit.

1. $\lim_{x\to 3} \frac{x^2-9}{x-3}$

2. $\lim_{x\to 2} \frac{\sqrt{x+2}-2}{x-2}$

3. $\lim_{x\to \infty} \frac{x^2-9}{x-3}$

4. $\lim_{x\to \infty} \frac{x-3}{x^2-9}$

L'Hôpital's Rule

If $\lim_{x\to a} f(x) = 0$ and $\lim_{x\to a} g(x) = 0$

and $f(x)$ and $g(x)$ are differentiable and where $g'(a) \neq 0$,

then $\lim_{x\to a} \frac{f(x)}{g(x)} = \lim_{x\to a} \frac{f'(x)}{g'(x)}$.

What does this mean?

Using L'Hôpital's Rule

Example 1:

$\lim_{x\to 3} \frac{x^2-9}{x-3}$

Example 2:

$\lim_{x\to 2} \frac{\sqrt{x+2}-2}{x-2}$

Example 3:

$\lim_{x\to \infty} \frac{x^2-9}{x-3}$

Example 4:

$\lim_{x\to \infty} \frac{x-3}{x^2-9}$

More Indeterminate Forms

$$\infty \cdot 0, \infty - \infty, 1^{\infty}, 0^{0}, \infty^{0}$$

Example 1:

$\lim_{x\to 0}\left(\frac{1}{x} - \cot x\right)$

Example 2:

$\lim_{x\to 0}(\cot x\,(x^2 + 5x))$

Example 3:

$\lim_{x\to 0^+}\sqrt{x}\ln x$