

Worksheet #21: L'Hôpital's Rule; Indeterminate Forms

Guidelines for using L'Hôpital's Rule:

1: $\frac{0}{0}, \frac{\infty}{\infty} \Rightarrow$ Apply L'Hôpital's Rule.

2: $0 \cdot \infty \Rightarrow$ Invert one term to the denominator.

3: $1^\infty, 0^0, \infty^0 \Rightarrow$ Use \ln , then take the limit.

4: $\infty - \infty \Rightarrow$ Find a common denominator or multiply by the conjugate, etc.

L'Hôpital's Rule: If $\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$ is in the form $\frac{0}{0}$ or $\frac{\infty}{\infty}$, then $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \lim_{x \rightarrow a} \frac{f'(x)}{g'(x)}$ if it exists.

Find the limit for the following:

1. $\lim_{x \rightarrow +\infty} 2x \sin(\pi/x)$

2. $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{1}{e^x - 1} \right)$

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