

4.8 L'Hospital's Rule

Goal: Given a limit of indeterminate form ($0/0$, ∞/∞ , etc) with differentiable functions, find the limit.

L'Hospital's Rule: If f and g are differentiable and $g'(x) \neq 0$ on an open interval I that contains a (except possibly at a), and $\lim_{x \rightarrow a} f(x) = \lim_{x \rightarrow a} g(x) = 0$ or $\lim_{x \rightarrow a} f(x) = \pm\infty$ and $\lim_{x \rightarrow a} g(x) = \pm\infty$, then

Examples:

Find the exact values of each of the following limits:

$$\lim_{x \rightarrow -1} \frac{x^2 + 6x + 5}{x^2 - 3x - 4}$$

$$\lim_{x \rightarrow 0} \frac{1 - \cos x}{2x^2}$$

$$\lim_{x \rightarrow 0} x \ln x$$

$$\lim_{x \rightarrow \infty} (1 + e^{2x})^{\frac{1}{x}}$$

Recall the formula for computing compound interest (4.3): $A = P \left(1 + \frac{r}{m}\right)^{mt}$. Find $\lim_{m \rightarrow \infty} A$.