1 4.8: L'Hospital's Rule

**Goal:** Given a limit of indeterminate form \((0/0, \infty/\infty, \text{etc.})\) with differentiable functions, find the limit.

**L'Hospital's Rule:** If \(f\) and \(g\) are differentiable and \(g'(x) \neq 0\) for all \(x\) “near” \(a\), and \(\lim_{x \to a} f(x) = \lim_{x \to a} g(x) = 0\) or \(\lim_{x \to a} f(x) = \pm\infty\) and \(\lim_{x \to a} g(x) = \pm\infty\), then

\[ \lim_{x \to a} \frac{f(x)}{g(x)} = \lim_{x \to a} \frac{f'(x)}{g'(x)} \]

**Examples:**

Find each of the following limits:

\[ \lim_{x \to 0} \frac{\cos x - 1}{x^2} \]

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

**On Your Own:** Compute $\lim_{x \to 0} (\cos x)^{1/x^2}$.