Announcements

- Homework 9 due today.
- Office hours moved this week.
  - Wednesday 11/7 office hours moved to Friday 11/9/2007.
- Homework 10 will be due Monday 11/12/2007.
- Exam 3 will be **Monday 11/19/2007**.

L'Hôpital's Rule

Let f and g be differentiable functions with $g'(x) \neq 0$ on an open interval containing c (except possibly c itself). Suppose

$$\lim_{x \to c} \frac{f(x)}{g(x)}$$

produces an indeterminate form $\frac{0}{0}$ or $\frac{\infty}{\infty}$, and that

$$\lim_{x \to c} \frac{f'(x)}{g'(x)} = L,$$

where L is either a finite number, $+\infty$, or $-\infty$. Then

$$\lim_{x \to c} \frac{f(x)}{g(x)} = L$$

- L'Hôpital's Rule also applies to one-sided limites and to limits to infinity (i.e., where x goes to $+\infty$ or $-\infty$).
- Be careful to check that the limit gives an indeterminate form before applying L'Hôpital's Rule. **Applying it blindly can give you the wrong answer.**

- Note that L'Hôpital's Rule applies only to the indeterminate forms $\frac{0}{0}$ and $\frac{\infty}{\infty}$.
- For other indeterminate forms such as 1^{∞}, 0^{0}, ∞^{0}, $\infty - \infty$, and $0\dot{\infty}$, need to manipulate into the form $\frac{0}{0}$ or $\frac{\infty}{\infty}$, then evaluate with L'Hôpital's Rule.

Special limits with e^x and $\ln x$

If k and n are positive numbers, then

$$\lim_{x\to 0^+} \frac{\ln x}{x^n} = -\infty \qquad \lim_{x\to +\infty} \frac{\ln x}{x^n} = 0$$

$$\lim_{x\to +\infty} \frac{e^{kx}}{x^n} = +\infty \qquad \lim_{x\to +\infty} x^n e^{-kn} = 0$$