Math Xb Spring 2004
Worksheet: L'Hôpital's Rule Day One
March 22, 2004

1. Evaluate each of the following limits.

   (a) $\lim_{x \to -2} \dfrac{x+2}{x^2+3x+2}$

   (b) $\lim_{x \to 0} \dfrac{x+\tan x}{\sin x}$

   (c) $\lim_{x \to \infty} \dfrac{\ln(\ln x)}{x}$

   (d) $\lim_{x \to 0} \dfrac{\sin^{-1} x}{x}$

   (e) $\lim_{x \to 0} \dfrac{1-e^{-2x}}{\sec x}$

(f) $\lim_{x\to\infty} \dfrac{(\ln x)^3}{x^2}$

2. (a) Find $\lim_{x\to\infty} \dfrac{\ln x}{x^p}$, where $p > 0$.

(b) What does your answer to part (a) say about the relative rates of growth of $\ln x$ and any power of x as x grows very large?

3. Given that

$$\lim_{x\to a} f(x) = 0 \qquad \lim_{x\to a} g(x) = 0 \qquad \lim_{x\to a} h(x) = 1$$
$$\lim_{x\to a} p(x) = \infty \qquad \lim_{x\to a} q(x) = \infty$$

which of the following are indeterminate forms? For those that are not an indeterminate form, evaluate the limit where possible.

(a) $\lim_{x\to a} \dfrac{f(x)}{g(x)}$

(b) $\lim_{x\to a} \dfrac{f(x)}{p(x)}$

(c) $\lim_{x\to a} \dfrac{h(x)}{p(x)}$

(d) $\lim_{x\to a} \dfrac{p(x)}{f(x)}$

(e) $\lim_{x\to a} \dfrac{p(x)}{q(x)}$