Math Xb Spring 2004
Worksheet: L'Hôpital's Rule Day Two
March 24, 2004

1. If an initial amount A_0 of money is invested at an interest rate r compounded n times a year, then the value of the investment after t years is

$$A(t) = A_0\left(1 + \frac{r}{n}\right)^{nt}.$$

   (a) Suppose \$1000 is invested in an account bearing 5% interest compounded annually. How much will the account be worth after 1 year?

   (b) Suppose the interest is compounded monthly instead. How much will the account be worth after 1 year?

   (c) Suppose the interest is compounded daily instead. How much will the account be worth after 1 year?

   (d) If we let $n \to \infty$, we refer to the *continuous compounding* of interest. Use L'Hôpital's Rule to find the value of the account after 1 year if the interest is compounded continuously.

   (e) Show that if A_0 dollars is invested at an interest rate r compounded continuously, then the amount after t years is A_0e^{rt}.

2. 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) $\lim_{x\to a} f(x)p(x)$

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

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

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

(e) $\lim_{x\to a} f(x)^{p(x)}$

(f) $\lim_{x\to a} h(x)^{p(x)}$

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

(h) $\lim_{x\to a} p(x)^{q(x)}$