

Math Xb Spring 2005
Worksheet: L'Hôpital's Rule Day Two

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 $n \rightarrow \infty$, 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 $A_0 e^{rt}$.

2. Given that

$$\begin{array}{lll} \lim_{x \rightarrow a} f(x) = 0 & \lim_{x \rightarrow a} g(x) = 0 & \lim_{x \rightarrow a} h(x) = 1 \\ \lim_{x \rightarrow a} p(x) = \infty & \lim_{x \rightarrow a} q(x) = \infty & \end{array}$$

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

- (a) $\lim_{x \rightarrow a} f(x)p(x)$
- (b) $\lim_{x \rightarrow a} h(x)p(x)$
- (c) $\lim_{x \rightarrow a} p(x)q(x)$
- (d) $\lim_{x \rightarrow a} f(x)^{g(x)}$
- (e) $\lim_{x \rightarrow a} f(x)^{p(x)}$
- (f) $\lim_{x \rightarrow a} h(x)^{p(x)}$
- (g) $\lim_{x \rightarrow a} p(x)^{f(x)}$
- (h) $\lim_{x \rightarrow a} p(x)^{q(x)}$