CALCULUS FINAL EXAM REVIEW CHAPTER 6

1. What are the two conditions to be able to use l'Hospital's Rule?

2. <u>Compound Interest Problem</u> : You recall from algebra that if money is left in a savings account earning interest compounded continuously at an annual percentage rate (APR) of 6%, then the amount of money, M, after t years is given by $M = M_0(1.06)^t$

a) Suppose that an investment of M_0 = $1000 is made at time t = 0 yr. Find $M'(t)$.

b) Find the instantaneous rate of change of the amount of money at t = 0, at t = 10, and at t = 100 yr. [$M'(0)$, $M'(10)$, $M'(100)$] What are the units of these rates?

c) Find the amount of money in the account at the times in part b. [$M(0)$, $M(10)$, $M(100)$] Does the rate of increase seem to be getting larger as the amount increases?

3. Find the limits using any <u>non-graphical</u> method. If using l'Hospital's rule, show that both conditions have been met.

a. $\lim\limits_{x\to\infty}\dfrac{5x^2-11x+7}{4+3x-2x^2}$

b. $\lim\limits_{x\to\infty}\dfrac{7x^2-4}{3-4x^4}$

c. $\lim\limits_{x\to 0}\dfrac{1-\cos x}{x}$

4. Write the definition of $\ln x$ as a definite integral.

5. Integrate the following:

a. $\int 5^x\,dx$

b. $\int e^{3x}\,dx$

c. $\int xe^{x^2}\,dx$

d. $\int \dfrac{(\ln x)^5}{x}\,dx$

e. $\int_1^7 \dfrac{1}{p}\,dp$

f. $\int \tan 3x\,dx$

6. Find the derivative of the following. Use log properties to assist you where possible:

a. $f(x) = \log_{10}(\tan x)$
b. $y = e^{5x}$
c. $f(x) = 10^{\sin x}$

d. $f(x) = x^3 \ln x$
e. $y = 5e^{\ln x^3}$
f. $y = \ln(\sin^5 x)$

g. $y = x^x$
h. $y = e^{5\ln x}$
i. $y = \ln(\csc x)$

7. Use logarithmic differentiation:

a. $y = (5x-7)^3(3x+1)^5$
b. $y = \dfrac{(x^2-3)^3}{(4x^5+5x)^7}$

c. $y = x^{\ln x}$
d. $y = (3x-4)^{\cos x}$