The University of Calgary
Department of Mathematics and Statistics
MATH 249L 03
Quiz # 5R

Fall 2008

Name:_____I.D.#:_____

1. Evaluate

   (a) $\lim_{x\to 0}\dfrac{x}{4^x-1}$

   (b) $\lim_{x\to -\infty}\dfrac{x}{4^x-1}$ [3]

2. Find y' if $y = x^x + \ln(x^2+1)$,for $x > 0$. [4]

3. How much money do you have to invest to get \$1000 in 5 years
   if the annual interest of 2% is compounded monthly ? [3]

SOLUTION

For 1a)since $4^0 = 1$

$\lim_{x\to 0}\dfrac{x}{4^x-1} = "\dfrac{0}{0}"$(L'H.)$= \lim_{x\to 0}\dfrac{(x)'}{(4^x-1)'} = \lim_{x\to 0}\dfrac{1}{4^x\ln 4} = \dfrac{1}{\ln 4}$

for b) $\lim_{x\to -\infty}\dfrac{x}{4^x-1} = "\dfrac{-\infty}{-1}" = +\infty$ (NO L'H.) since $"4^{-\infty}" = 0$

For 2)

by Chaint Rule and then product Rule

$y' = e^{x\ln x}(x\ln x)' + [\ln(x^2+1)]' =$

$= e^{x\ln x}\left(\ln x + x\cdot\dfrac{1}{x}\right) + \dfrac{1}{x^2+1}\left(x^2+1\right)' =$

$= e^{x\ln x}(\ln x + 1) + \dfrac{2x}{x^2+1}$

also by log.diff.BUT only the first part $u = x^x$

$\ln u = \ln[x^x] = x\ln x$

$\dfrac{u'}{u} = 1\cdot\ln x + x\cdot\dfrac{1}{x} = \ln x + 1$ and

$u' = x^x[\ln x + 1]$ then

$y' = u' + [\ln(x^2+1)]' =$ ...as above

For 3)

the correct formula is $A(t) = A_0\left(1+\dfrac{p}{100n}\right)^{nt}$ where $p = 2, n = 12, t = 5$

and $A = 1000$ $A_0 = ?$

$1000 = A_0\left(1+\dfrac{2}{1200}\right)^{5\cdot 12} = A_0\left(\dfrac{601}{600}\right)^{60}$ thus $A_0 = 1000\cdot\left(\dfrac{600}{601}\right)^{60} = \$\ 9049.127$