The University of Calgary
Department of Mathematics and Statistics
MATH 249/01 Quiz # 5R Fall 2010

Name:_____________________________**I.D.#:**__________________

1. Solve for x: $2\ln(x-4) - \ln(9x) = 0.$ [3]
2. Find the domain and derivative of $f(x) = x^{2x} + \ln(1+x^2).$ [4]
3. How many years we have to keep \$1,000 deposited to get \$1200 if the annual interest of 6% is compounded monthly ? [3]

Solution

For 1)

using the properties of ln :$2\ln(x-4) - \ln(9x) = \ln\frac{(x-4)^2}{9x} = 0$

OR $\ln(x-4)^2 = \ln(9x)$ then apply exp.function to get

$(x-4)^2 = 9x \qquad x^2 - 17x + 16 = 0 \qquad (x-16)(x-1) = 0$

two possible solutions but $x-4$ must be positive so only solution $x = 16$

For 2)

$f(x) = x^{2x} + \ln(1+x^2) = e^{2x\ln x} + \ln(1+x^2)$ for any $x > 0$

$$f'(x) = \left[e^{2x\ln x}\right]' + \left[\ln(1+x^2)\right]' = e^{2x\ln x}(2x\ln x)' + \frac{1}{1+x^2}\cdot(1+x^2)' =$$

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

For 3)

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

where $p = 6 \quad , n = 12 \quad A_0 = 1000 \quad t = ?$

$$1200 = 1000\left(1 + \frac{6}{1200}\right)^{12t} = 1000\left(\frac{201}{200}\right)^{12t} \text{ solve for t}$$

$$\frac{1200}{1000} = \left(\frac{201}{200}\right)^{12t} \qquad \ln 1.2 = 12t\ln\frac{201}{200} \qquad t = \frac{\ln(1.2)}{12\ln(201/200)} = 3.046 \text{ years}$$