Mathematics 122

Quiz # 14 Name: Key

You must show your work to get full credit.

Find the following derivatives.

1. $f(t) = te^{-3t}$.

$f'(t) = \dfrac{e^{-3t} - 3te^{-3t}}{}$

$f'(t) = (1)e^{-3t} + te^{-3t}(-3)$

$= e^{-3t} - 3te^{-3t}$

$= (1-3t)e^{-3t}$

2. $y = x^2(3x+1)^4$.

$\dfrac{dy}{dx} = 2x(3x+4)^4 + 12x^2(3x+1)^3$

$\dfrac{dy}{dx} = 2x(3x+1)^4 + x^2 4(3x+1)^3(3)$

$= 2x(3x+4)^4 + 12x^2(3x+1)^3$

3. $y = x\ln(x) - x$.

$y' = \ln(x)$

$y' = 1\ln(x) + x\left(\frac{1}{x}\right) - 1$

$= \ln(x) + 1 - 1 = \ln(x)$

4. $w = \frac{z^3}{e^z}$. $= z^3e^{-z}$

$\dfrac{dw}{dz} = \dfrac{3z^2e^{-z} - z^3e^{-z}}{}$

$\dfrac{dw}{dz} = 3z^2e^{-z} + z^3(-e^{-z})$

$= 3z^2e^{-z} - z^3e^{-z}$

$= (3z^2 - z^3)e^{-z}$

5. $f(x) = \dfrac{ax+2}{ax+3}$ where a is a constant.

$f'(x) = \dfrac{a}{(ax+3)^2}$

$= \dfrac{(ax+2)'(ax+3) - (ax+2)(ax+3)'}{(ax+3)^2}$

$= \dfrac{a(ax+3) - (ax+2)(a)}{(ax+3)^2}$

$= \dfrac{a^2x + 3a - a^2x - 2a}{(ax+3)^2} = \dfrac{a}{(ax+3)^2}$