Mathematics 122

Quiz #19 Name: Key

You must show your work to get full credit.

Let a, b, c, and d be constants, then find the derivatives of the following:

2 pts (1) $y = \dfrac{e^{3x}}{x+1}$ $\quad y' =$ _____

$y' = \dfrac{(e^{3x})'(x+1) - e^{3x}(x+1)'}{(x+1)^2}$ OR $y = e^{3x}(x+1)^{-1}$

$= \boxed{\dfrac{3e^{3x}(x+1) - e^{3x}}{(x+1)^2}}$ $y' = (e^{3x})'(x+1)^{-1} + e^{3x}\left((x+1)^{-1}\right)'$

$= \boxed{3e^{3x}(x+1)^{-1} - e^{3x}(x+1)^{-2}}$

2 pts (2) $f(t) = \dfrac{\ln(t)}{t^3}$ $\quad f'(t) =$ _____

$f'(t) = \dfrac{\ln(t)'t^3 - \ln(t)(t^3)'}{t^3}$ OR $f(t) = t^{-3}\ln(t)$

$= \dfrac{\frac{1}{t}t^3 - 3\ln(t)t^2}{(t^3)^2}$ $f'(t) = (t^{-3})'\ln(t) + t^{-3}(\ln(t))'$

$= \dfrac{t^2 - 3\ln(t)t^2}{t^6}$ $= -3t^{-4}\ln(t) + t^{-3}\frac{1}{t}$

$= \boxed{-3t^{-4}\ln(t) + t^{-4}}$

1 pt (3) $w = \dfrac{az+b}{cz+d}$ $\quad \dfrac{dw}{dz} =$ _____

$\dfrac{dw}{dz} = \dfrac{(az+b)'(cz+d) - (az+b)(cz+d)'}{(cz+d)^2}$

$= \dfrac{a(cz+d) - c(az+b)}{(cz+d)^2}$

$= \boxed{\dfrac{ad-bc}{(cz+d)^2}}$

or $w' = ((cz+d)^{-1})'(az+b) + (cz+d)^{-1}(az+b)'$

$= \boxed{-(cz+d)^{-2}(c)(az+b) + (cz+d)^{-1}(a)}$