Mathematics 122

Quiz 14 Name: Key

You must show your work to get full credit.

1. Compute the following derivatives.

(a) $f(x) = 5e^{x^2+x}$ $\qquad f'(x) = 5(2x+1)e^{x^2+x}$

$f'(x) = 5e^{x^2+x}(x^2+x)'$

$= 5e^{x^2+x}(2x+1)$

(b) $C(q) = (5q^3+q^2)^4$ $\qquad \frac{dC}{dq} = 4(15q^2+2q)(5q^3+q^2)^3$

$C'(q) = 4(5q^3+q^2)^3(5q^3+q^2)'$

$= 4(5q^3+q^2)^3(15q^2+2q)$

(c) $w = \sqrt{z^2+1} = (z^2+1)^{\frac{1}{2}}$ $\qquad \frac{dw}{dz} = z(z^2+1)^{-\frac{1}{2}} = \frac{z}{\sqrt{z^2+1}}$

$\frac{dw}{dz} = \frac{1}{2}(z^2+1)^{-\frac{1}{2}}(z^2+1)'$

$= \frac{1}{2}(z^2+1)^{-\frac{1}{2}}(2z) = z(z^2+1)^{-\frac{1}{2}}$

(d) $A(x) = \frac{x-1}{x^2+1} = (x-1)(x^2+1)^{-1}$ $\qquad A'(x) = (x^2+1)^{-1} - 2x(x-1)(x^2+2)^{-2}$

$A'(x) = (x-1)'(x^2+1)^{-1} + (x-1)((x^2+1)^{-1})'$

$= 1(x^2+1)^{-1} + (x-1)(-1)(x^2+1)^{-2}(x^2+1)'$

$= (x^2+1)^{-1} - (x-1)(x^2+2)^{-2}(2x)$

(e) $y = e^{-3} + \ln(e^x+1)$ $\qquad y' = \frac{e^x}{e^x+1}$

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

$= 0 + \frac{1}{e^x+1}e^x$

OR $\quad A'(x) = \frac{(x-1)'(x^2+1) - (x-1)(x^2+1)'}{(x^2+1)^2}$

$= \frac{1(x^2+1) - (x-1)(2x)}{(x^2+1)^2}$

$= \frac{x^2+1-2x^2+2x}{(x^2+1)^2} = \frac{-x^2+2x+1}{(x^2+1)^2}$