Calculus Help

Product Rule Given 2 differentiable fns $f(x)$ & $g(x)$ then the PRODUCT FUNCTION

$$F(x) = f(x) \cdot g(x)$$

is also diff'ble and

$$\frac{dF}{dx}(x) = F'(x) = f'(x)\,g(x) + f(x)\,g'(x)$$

Power of a Fn Rule Given a differentiable fn $f(x)$ then a new fn constructed as a 'power' of $f(x)$:

$(2x^3 - 5x + 2)^3$

$$F(x) = \left(f(x)\right)^n$$

is also diff'ble and the derivative is:

$$F'(x) = n\left(f(x)\right)^{n-1} \cdot f'(x)$$

eg pg 90

\# 2b Differentiate $y = \underbrace{(3x^2+4)}_{f(x)}\underbrace{(3+x^3)^5}_{g(x)}$

$$\frac{dy}{dx} = y' = (3x^2+4)'(3+x^3)^5 + (3x^2+4)\left((3+x^3)^5\right)'$$

$$\boxed{= 6x(3+x^3)^5 + (3x^2+5)\left(5(3+x^3)^4\right)\cdot(3x^2)}$$

$$= 3x(3+x^3)^4\left(2(3+x^3) + 5x(3x^2+5)\right)$$

$$= 3x(3+x^3)^4\left(17x^3 + 25x + 6\right)$$

eg pg 91

5e Determine the value of the derivative of the fn

$$y = (\underbrace{2x+1}_{f(x)})^5 (\underbrace{3x+2}_{g(x)})^4 \quad @ \quad x=-1.$$

$$y' = 5(2x+1)^4(2)(3x+2)^4 + (2x+1)^5\left(4(3x+2)^3(3)\right)$$

$$y'\Big|_{x=-1} = 5(2(-1)+1)^4(2)(3(-1)+2)^4 + (2(-1)+1)^5\left(4(3(-1)+2)^3(3)\right)$$

evaluated at

$$= 10 + (-1)(4(-1)(3))$$

$$= 10 + 12$$

$$= 22 \quad (= m_{tan} \ @ \ x=-1$$