MCV4U

PRODUCT RULE - POWER OF A FN RULE

Hulk Check.

#3

d. $h(x)=(x-3)^3(2x+1)^2$

$$\frac{dh}{dx} = h'(x) = 3(x-3)^2(1)(2x+1)^2 + (x-3)^3\left(2(2x+1)^1(2)\right)$$

$$= (x-3)^2(2x+1)\left(3(2x+1) + 4(x-3)\right)$$

$$= (x-3)^2(2x+1)(10x-9)$$

e. $f(x)=(x-2)^2(3x+2)^3(x+4)^2$ *(Triple product...)*

$$f'(x) = 2(x-2)(3x+2)^3(x+4)^2 + (x-2)^2\left(3(3x+2)^2(3)\right)(x+4)^2 + (x-2)^2(3x+2)^3\left(2(x+4)\right)$$

$$= (x-2)(3x+2)^2(x+4)\left(2(3x+2)(x+4) + 9(x-2)(x+4) + 2(x-2)(3x+2)\right)$$

$$= (x-2)(3x+2)^2(x+4)(21x^2+38x-10)$$

4) Determine the equation of the tangent to the curve $f(x)=(x+3)^2(2x+1)^3$ at the point $(-1,-4)$.

$$m_{tan} = f'(-1)$$

$$f'(x) = 2(x+3)(2x+1)^3 + (x+3)^2\left(3(2x+1)^2(2)\right)$$

Note: because we are just calculating a number, no need to "simplify"

$$m_{tan} = f'(-1) = 20$$

$\therefore$ The eqn is $y = 20x + b$ use $(-1,-4)$ to find $b$

$$-4 = 20(-1) + b$$

$$\Rightarrow 16 = b$$

$\therefore$ $y = 20x + 16$ is the tangent's eqn

$y - y_1 = m(x - x_1)$

$y + 4 = 20(x + 1)$

$y = 20x + 16$

5) Determine the point(s) on the curve $h(x)=3(x-1)(x^2-4)$ where the tangent is horizontal. Round your values to two decimal places. *(Hint: What is the slope of a horizontal line?)*

$h'(x) = 3(x^2-4) + 3(x-1)(2x)$

we want $h'(x)=0$ ← horizontal lines have zero slope!

$\Rightarrow \quad 3(x^2-4) + 3(x-1)(2x) = 0$

$\div 3 \quad \rightarrow \quad x^2 - 4 + 2x^2 - 2x = 0$

$\Rightarrow \quad 3x^2 - 2x - 4 = 0$ does not factor.

QF $\quad x = \dfrac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \dfrac{2 \pm \sqrt{4+48}}{6} = \dfrac{2 \pm \sqrt{52}}{6}$

$= \dfrac{2 \pm 2\sqrt{13}}{6} = \dfrac{1 \pm \sqrt{13}}{3}$

$\therefore \quad x = \dfrac{1+\sqrt{13}}{3}, \quad x = \dfrac{1-\sqrt{13}}{3}$

$= 1.54 \qquad = -0.87$

∴ The points where the tangent(s) are horizontal are:

$(1.54, h(1.54))$ and $(-0.87, h(-0.87))$

$= (1.54, -2.64) \qquad (-0.87, 18.19)$