Note Title 2/23/2009

POWER RULE, SUM + DIFFERENCE RULES.

NEWTON'S NOTATION – $f'(x) \Rightarrow$ f PRIME OF x

LEIBNITZ'S NOTATION – $\frac{d}{dx} \Rightarrow$ DERIVATIVE WITH RESPECT TO x

I POWER RULE

$f(x) = ax^n$ $\quad\quad$ $y = ax^n$

$f'(x) = anx^{n-1}$ $\quad\quad$ $\frac{dy}{dx} = anx^{n-1}$

IE FIND THE TANGENT LINE OF THE FUNCTION

$y = 9x^2 - 6x$ @ $x = 1$

SOLN $\frac{dy}{dx} = 9 \cdot 2 \cdot x^1 - 6 \cdot 1 \cdot x^0$

$\frac{dy}{dx} = 18x - 6$ } EVALUATE WHEN $x = 1$

$m = 18(1) - 6$

$m = 12$

$y = 9x^2 - 6x$

$y = 9(1)^2 - 6(1)$

$y = 3$

$(y - 3) = 12(x - 1)$

THE DERIVATIVE OF A CONSTANT IS ALWAYS 0

IE $y = c$ $\qquad 6x^0$

$$\frac{dy}{dx} = 0 \qquad 0 \cdot 6 \cdot x^{-1} = 0$$

THE DERIVATIVE OF A CONSTANT TIMES A FUNCTION

$$\frac{d}{dx}\left(c \cdot f(x)\right) = c \frac{d}{dx} f(x)$$

IE $y = 3x^2 + 3x^4$

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

$$= 3 \frac{d}{dx}\left(x^2 + x^4\right)$$

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

$$= 6x + 12x^3$$

THE SUM AND DIFFERENCE RULE

IF $F(x) = f(x) + g(x)$ THEN $F'(x) = f'(x) + g'(x)$

$\underline{\underline{\text{II}}}$ GIVEN THE EQUATION $y = 4x^2 + 6x + 9$, FIND THE POINT AT WHICH THE TANGENT LINE IS HORIZONTAL

<u>SOLN</u> $m = 0$

$$\frac{dy}{dx} = 4 \cdot 2 \cdot x^1 + 6 \cdot 1 \cdot x^0 + 0$$

$$\frac{dy}{dx} = 8x + 6$$

$m = 8x + 6$

$0 = 8x + 6$

$\frac{-6}{8} = \frac{8x}{8}$

$-\frac{3}{4} = x$

$y = 4\left(-\frac{3}{4}\right)^2 + 6\left(-\frac{3}{4}\right) + 9$

$y = \frac{27}{4}$

$\left(-\frac{3}{4}, \frac{27}{4}\right)$