No work = no credit

1.) Consider $f(x) = 3x^2 - 5x + 11$.

a.) Use the <u>definition of the derivative</u> to find $f'(x)$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h \to 0} \frac{(3(x+h)^2 - 5(x+h) + 11) - (3x^2 - 5x + 11)}{h}$$

$$= \lim_{h \to 0} \frac{3x^2 + 6xh + 3h^2 - 5x - 5h - 3x^2 + 5x - 11}{h}$$

$$= \lim_{h \to 0} \frac{6xh + 3h^2 - 5h}{h}$$

$$= 6x - 5$$

b.) For what x values is f increasing (rising)?

$$x > \frac{5}{6}$$

$\frac{3}{6}$ for $x = \frac{5}{6}$

c.) Find the equation of the tangent line to $f(x)$ when $x = 1$

$$f'(1) = 1$$

$$f(1) = 3 - 5 + 11 = 9$$

$$y - 9 = 1(x - 1)$$

$$\text{or} \quad y = x + 8$$

2.) Find the equation of the <u>second</u> derivative of $g(x) = \sqrt{x^3 - 5x}$

$$g'(x) = \tfrac{1}{2}(x^3 - 5x)^{-1/2}(3x^2 - 5)$$

$$g''(x) = -\tfrac{1}{4}(x^3 - 5x)^{-3/2}(3x^2 - 5)(3x^2 - 5) + 6x \cdot \tfrac{1}{2}(x^3 - 5x)^{-1/2}$$

3.) Suppose $R(x) = \dfrac{60x^2 + 74x}{2x + 2}$ describes the revenue (in dollars) from the sale of x units of a product.

   a.) Find $\overline{MR}(x)$.

$$\overline{MR}(x) = \frac{(120x + 74)(2x + 2) - 2(60x^2 + 74x)}{(2x + 2)^2}$$

   b.) Find and interpret $\overline{MR}(49)$ $= 30.0028$

The revenue cost from the 49th unit is about $30.0028

   c.) Find and interpret $R(49) - R(48)$ $= 30$

The revenue from the 49th unit is exactly $30.