Math 160 Quiz # 6 Name_Dr. Shannon_

1. The weekly demand for widgits is given by

$$p = 800-5x \qquad (0 \le x \le 160)$$

where p denotes the unit price and x denotes the quantity demanded.
The weekly total cost function associated with manufacturing widgits is given by

$$C(x) = 800 + 600x - 3x^2$$

Find:

a: the revenue function: *Revenue is the quantity sold, x times the price at which it is sold, p=800-5x so:*

**$R(x) = 800x-5x^2$**

b: the profit function: *Profit is revenue - cost or R(x) - C(x) so (make sure you distribute the - sign over all the components of cost):*

**P(x) =** $R(x)-C(x) = 800x-5x^2 - (800 + 600x - 3x^2) = 800x-5x^2 - 800 - 600x + 3x^2 =$ **$200x -2x^2 - 800$**

c: The marginal cost function: *is just the derivative of the cost function:*

**$C'(x) = 600-6x$**

d: The marginal revenue function: *is just the derivative of the revenue function:*

**$R'(x) = 800 - 10x$**

e: The marginal profit function: *is just the derivative of the profit function:*

**$P'(x) = 200-4x$** *; Which is also R'(x) - C'(x)*

f. Compute values of all five of these functions if the quantity demanded is 50: *Just plug in 50 to the above to get:*

**$R(50) = 800(50)-5(50)^2 = 40{,}000 - 12{,}500 = 27{,}500$**
**$P(50) = 200(50) -2(50)^2 - 800 = 10{,}000-5000-800 = 4200$**
**$C'(50) = 600-6x(50) = 300$**
**$R'(50) = 800 - 10(50) =300$**
**$P'(x) = 200-4(50) = 0$**

g. Interpret your results:

***Since P'(x) = 0, you cannot increase profit by increasing production, which you could if P'(x)>0. Nor can you increase profit by decreasing production, which you could if P'(x) < 0. So your profit is maximized when you sell 50 widgits.***

2. Use Differentials to approximate the square root of 5.

*We know $\sqrt{4} = 2$ and that is the closest perfect square to 5.*
*So we let x=4; dx = 1 (so x+dx = 5)*
*and find dy which will approximate the change in $\sqrt{x}$ as x moves from 4 to 5,*
*using dy = f'(x) dx, with $f(x) = \sqrt{x}$.*
$f'(x) = \frac{1}{2} x^{-1/2} = 1/(2\sqrt{x})$; *so* $f'(4) = \frac{1}{4}$. *Thus* $dy = (\frac{1}{4})(1) = \frac{1}{4}$ *and* $\sqrt{5} \approx \sqrt{4} + \frac{1}{4} =$ **2.25**

If the square root of 5 is 2.236, what is the error in your approximation?

*2.25 - 2.236 =* **.014** *is the error in this approximation.*