Section 2.5 Applications of Derivatives (Minimum homework: 1 – 9 odds)

1) The cost function for producing x units of a certain product is: $C(x) = 0.1x^2 + 8x + 100$,

a) Find C(100)
b) Interpret your answer to part a.
c) Create the marginal cost function $C'(x)$ for this product.
d) Find C'(100)
e) Interpret your answer to question part d.

1a) $C(100) = 0.1(100)^2 + 8(100) + 100$

$C(100) = 1900$

1b) The cost to produce 100 units of the product is $1,900

1c) $C'(x) = 2(0.1x) + 8$

$C'(x) = 0.2x + 8$

$C'(100) = 0.20(100) + 8$

1d) $C'(100) = 28$

1e) It will cost an additional $28 to produce the 101st unit of the product.

3) Suppose that the cost in dollars to make x cell phone cases is given by: $C(x) = \ln(x) + 2x$

a) Find C(100) (round to 2 decimals)

b) Interpret your answer to part a.

c) Create the marginal cost function $C'(x)$ for this product.

d) Find C'(100) (round to 2 decimals)

e) Interpret your answer to question part d.

3a) $C(100) = \ln(100) + 2(100)$

$= 204.60517$

$C(100) = 204.61$

3b) It will cost $204.61 to produce 100 cell phone cases.

Deriv Ln(x)

$\frac{1}{x}$

Denom

Deriv x in num.

3c) $C'(x) = \frac{1}{x} + 2$

$C'(x) = \frac{1}{x} + 2$

3d) $C'(100) = \frac{1}{100} + 2$

$C'(100) = 2.01$

3f) It will cost an additional $2.01 to produce the 101st cell phone case.

5) Bob's Bobble heads company determines the profit function for producing and selling a certain bobble head can be modeled by: $P(x) = -0.001x^2 + 8x - 1000 \;\; 0 \leq x \leq 7000$. Where x represents the number of bobble heads sold and P(x) represents the monthly profit in dollars.

a) Find P(1000)
b) Interpret your answer to part a. (round your answer to 2 decimals)
c) Create the marginal profit function $P'(x)$ for this product.
d) Find P'(1000).
e) Interpret your answer to part d.

5a) $P(1000) = -0.001(1000)^2 + 8(1000) - 1000$

$P(1000) = 6000$

5b) The monthly profit is $6,000 in a month in which 1000 bobble heads are sold.

5c) $P'(x) = 2(-.001)x + 8$

$P'(x) = -0.002x + 8$

5d) $P'(1000) = -0.002(1000) + 8 = 6$

$P'(1000) = 6$

5e) An additional $6 of profit will be earned by selling the 1001st bobble head.

7) A self-employed person determines that the weekly profit from his current vending machine route can be modeled by: $P(x) = 10x - \sqrt{x} \quad 0 \leq x \leq 200$; where x represents the number of vending machines stocked and P(x) represents the weekly profit.

a) Find P(64)
b) Interpret your answer to part a. (round your answer to 2 decimals)
c) Create the marginal profit function $P'(x)$ for this product.
d) Find P'(64). (round to 2 decimals)
e) Interpret your answer to part d.

7a) $P(64) = 10(64) - \sqrt{64} = 632$

$P(64) = 632$

7b) The profit will be $632 in a week in which 64 vending machines are stocked.

7c) $P(x) = 10x - x^{1/2}$

$P'(x) = 10 - \frac{1}{2}x^{1/2 - 2/2}$

$P'(x) = 10 - \frac{1}{2\sqrt{x}}$

$P'(x) = 10 - \frac{1}{2}x^{-1/2}$

$P'(x) = 10 - \frac{1}{2x^{1/2}}$

7d) $P'(64) = 10 - \frac{1}{2\sqrt{64}}$

$P'(64) = 9.94$

7e) An additional profit of $9.94 will be earned by stocking the 65th vending machine.

9) A Sun City couple has a small garden, and they grow blueberries. They have found the price-demand function is: $p(x) = -0.50x + 6.50$

Where x is the number of quarts of blueberries demanded and $p(x)$ represents the price per quart in dollars.

a) Find p(5) round to 1 decimal.
b) Interpret you answer to part a.
c) Create a revenue function R(x) hint $R(x) = x * p(x)$ (revenue = quantity*price)
d) Find R(5).
e) Interpret your answer to part d.
f) Find the marginal revenue function R'(x).
g) Find R'(5).
h) Interpret your answer to part g.

9a) $P(5) = -0.50(5) + 6.50 = 4$

$p(5) = 4$

9b) *at a price of* $4 *per quart*, 5 *quarts will be demanded*

9c) $R(x) = (-0.50x + 6.50)x$

$R(x) = -0.50x^2 + 6.50x$

9d) $R(5) = -0.50(5)^2 + 6.50(5)$
$= 20$

$R(5) = 20$

9e) The revenue will be $20 when 5 quarts of blueberries are sold.

9f) $R'(x) = 2(-0.50)x + 6.50$
$= -1x + 6.50$

$R'(x) = -x + 6.5$

9g) $R'(5) = -1(5) + 6.50$

$R'(5) = 1.50$

9h) An additional $1.50 of revenue will be earned when the 6th quart of blueberries is sold.