MA 229 Mrs Alexander

Quiz 6: 3.4-3.5

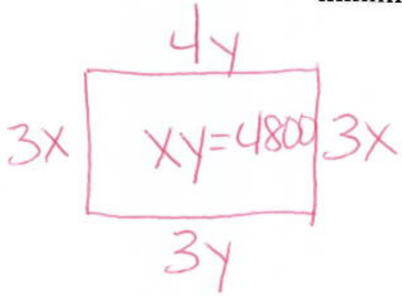
Show work for credit!

NAME Key F'09

P 253, #50a

1. A fence is to be built to enclose a rectangular region of 4800 square feet. The fencing material along three of the sides costs $3 per foot. The fencing material along the fourth side costs $4 per foot. Find the dimensions of the fence which minimize its cost.

(6)



$A = 4800 = XY$

$X = \frac{4800}{Y}$

$C = 6X + 7Y$ (2pt)

$C = 6\left(\frac{4800}{Y}\right) + 7Y$

$C = \frac{28800}{Y} + 7Y$

$C' = -\frac{28800}{Y^2} + 7$

$0 = -\frac{28800}{Y^2} + 7$

$-7 = -\frac{28800}{Y^2}$

$-7Y^2 = -28800$

$Y^2 = \frac{-28800}{-7}$

$Y \approx 64.1$ ft

$X = \frac{4800}{64.1}$

$X \approx 74.9$ ft

P 217, #15

did part (a) in class

2. A commodity has a demand function of $p = 100 - 0.5x^2$ and a total cost function of $C = 40x + 37.5$.

a. What price yields a maximum profit? (Remember: $P = xp - C$, where P is profit, x is number of units sold, p is price per unit, and C is the total cost.)

(5)

$P = x(100 - 0.5x^2) - (40x + 37.5)$

$P = 100X - 0.5X^3 - 40X - 37.5$

$P = -0.5X^3 + 60X - 37.5$

$P' = -1.5X^2 + 60$

$0 = -1.5X^2 + 60$

$-60 = -1.5X^2 \Rightarrow 40 = X^2 \Rightarrow X = 6.32$ units $(= \sqrt{40})$

$p = 100 - 0.5X^2$

$p = 100 - 0.5(40)$

$p = 100 - 20$

$p = \$80$/unit

b. When the profit is maximized, what is the average cost per unit?

(4)

$\overline{C} = \frac{C}{X} = \frac{40X + 37.5}{X}$

$\overline{C} = 40 + \frac{37.5}{X}$

$\overline{C} = 40 + \frac{37.5}{\sqrt{40}}$

$\overline{C} = \$45.93$

P207, #3 3. Find two positive numbers such that the sum of the first and twice the second is 36 and the product is a maximum. Show work for credit.

$X + 2y = 36 \Rightarrow X = 36 - 2Y$

$P = XY$

(5) $P = (36 - 2y)Y$

$P = 36Y - 2Y^2$

$P' = 36 - 4y$

$0 = 36 - 4y$

$-36 = -4y$

$y = 9$

$X = 36 - 2(9) = 18 = X$

P217, #7 (did in class) 4. Production costs for manufacturing a certain product can be modeled by $C = 2x^2 + 255x + 5000$. Find the number of units x that produces the minimum average cost per unit, $\overline{C} = \frac{C}{x}$.

$\overline{C} = \frac{2X^2 + 255X + 5000}{X}$

$\overline{C} = 2X + 255 + \frac{5000}{X}$

(5) $\overline{C}' = 2 - \frac{5000}{X^2}$

$0 = 2 - \frac{5000}{X^2}$

$-2 = -\frac{5000}{X^2}$

$-2X^2 = -5000$

$X^2 = \frac{-5000}{-2}$

$X^2 = 2500$

$X = 50$ units