

# Homework 6

## Section 2.6

4) A furniture store expects to sell 640 sofas at a steady rate next year. The manager of the store plans to order these sofas from the manufacturer by placing several orders of the same size spaced equally throughout the year. The ordering cost for each delivery is \$160, and carrying costs, based on average number of sofas in inventory, amount to \$32 per year for one sofa.

a) Let  $x$  be the order quantity and  $r$  the number of orders placed during the year. Find the inventory cost in terms of  $x$  and  $r$ .

b) Find the constraint function.

c) Determine the economic order quantity that minimizes the inventory cost, and then find the minimum inventory cost

a) Inventory cost =  $I = 160r + 32\left(\frac{x}{2}\right) = 160r + 16x$  \*

b)  $xr = 640$

c)  $xr = 640 \Rightarrow r = \frac{640}{x} \Rightarrow I(x) = 160\left(\frac{640}{x}\right) + 16x = \frac{102400}{x} + 16x$

$$I'(x) = \frac{-102400}{x^2} + 16$$

$$0 = \frac{-102400}{x^2} + 16 \Rightarrow \frac{102400}{x^2} = 16 \Rightarrow 102400 = 16x^2 \Rightarrow x^2 = 6400 \Rightarrow x = 80$$

check that this is a min:  $I' = \frac{-}{80} +$

minimum when  $x = 80$

$$I(80) = \frac{102400}{80} + 16(80) = 1280 + 1280 = \boxed{\$2560}$$

5) A California distributor of sporting equipment expects to sell 10,000 cases of tennis balls during the coming year at a steady rate. Yearly carrying cost (to be computed on the average number of cases in stock during the year) are \$10 per case, and the cost of placing an order with the manufacturer is \$80.

a) Find the inventory cost incurred if the distributor orders 500 cases at a time during the year.

b) Determine the economic order quantity, that is, the order quantity that minimizes the inventory cost.

a) Inventory cost =  $I = 80r + 10\left(\frac{x}{2}\right) = 80r + 5x$  \*

$$x = 500 \Rightarrow r = \frac{10,000}{500} = 20$$

$$I = 80(20) + 5(500) = 1600 + 2500 = \boxed{\$4100}$$

b)  $I = 80r + 5x$ ,  $xr = 10,000 \Rightarrow r = \frac{10,000}{x}$

$$I(x) = 80\left(\frac{10,000}{x}\right) + 5x = \frac{800,000}{x} + 5x \Rightarrow I'(x) = \frac{-800,000}{x^2} + 5$$

$$0 = \frac{-800,000}{x^2} + 5 \Rightarrow 5 = \frac{800,000}{x^2} \Rightarrow 5x^2 = 800,000 \Rightarrow x^2 = 160,000 \Rightarrow x = 400$$

$$I' = \frac{-}{400} +$$

$$x = 400 \text{ cases}$$

classwork graded: CW9 #2