5. Some Applied Examples

These Good Problems closely follow Section 2.9 of our book. We will apply the tools of Calculus that we have added to our toolbox up to this point in the semester.

1. The manager of a garden store wants to build a 600 square foot rectangular enclosure on the store's parking lot in order to display some equipment. Three sides of the enclosure will be built with redwood fencing at a cost of $7 per running foot. The fourth side will be built of cement blocks at a cost of $14 per running foot. Find the dimensions that minimize the cost of the enclosure.

2. A concert promoter has found that if s/he sells tickets for \$50 each then s/he can sell 1200 tickets, but for for every \$5 rise in price 50 less tickets will be sold. What price should the tickets be sold at to maximize revenue?

3. **Thought Exercise**. The profit function is obtained by subtracting the cost function from the revenue function,

$$P(x) = R(x) - C(x).$$

Determine criteria on the marginal revenue and marginal cost functions in order for the profit function to have a (local) maximum.

4. A company sells q ribbon winders per year at $\$p$ per winder. The demand function for ribbon winders is given by $p = 300 - 0.02q$. The ribbon winders cost $\$30$ each to manufacture, plus there are fixed costs of $\$9000$ per year. How many winders should be produced to maximize the profit?

[Reminder: Revenue $= q \cdot p$.]

5. The cost in dollars to produce x gift baskets is given by $C(x) = 160 + 2x + 0.1x^2$. How many baskets should be produced in order to minimize average cost?

[Reminder: Average Cost $= \frac{C(x)}{x}$.]

6.   You have a 10 inch by 10 inch piece of cardboard which you plan to cut and fold as shown to form a box with a top. Find the dimensions of the box that has the largest volume.
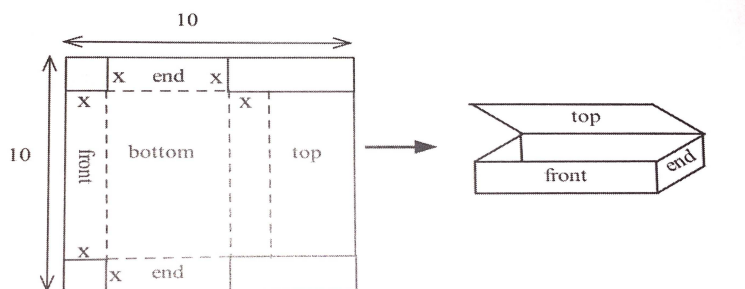
7.   You wish to open a coffee shop. In planning you estimate that if there is enough seating for between 40 and 80 people, the daily profit will be $50 per seat. However, if the seating capacity is more than 80 seats then the daily profit per seat will be decreased by $1 per seat over 80. What should the seating capacity be in order to maximize your shop's profit?