

1. Shannise Cole makes and sells candy. She has found that the cost per box for making x boxes of candy is given by

$$C(x) = x^2 - 40x + 405.$$

- (a) How much does it cost per box to make 15 boxes? 18 boxes? 30 boxes?
- (b) What point on the graph corresponds to the number of boxes that will make the cost per box as small as possible?
- (c) How many boxes should she make in order to keep the cost per box at a minimum?
What is the minimum cost per box?

2. A researcher in physiology has decided that a good mathematical model for the number of impulses fired after a nerve has been stimulated is given by $y = -x^2 + 20x - 60$, where y is the number of responses per millisecond and x is the number of milliseconds since the nerve was stimulated.

(a) When will the maximum firing rate be reached?

(b) What is the maximum firing rate?

3. Suppose the supply and demand for a certain textbook are given by

$$\text{supply: } p = \frac{1}{5}q^2$$

$$\text{demand: } p = -\frac{1}{5}q^2 + 40$$

where p is price and q is quantity.

(a) How many books are demanded at a price of 10? 20? 30? 40?

(b) How many books are supplied at a price of 5? 10? 20? 30?

(c) Find the equilibrium price and the equilibrium quantity.

4. If the revenue function for a company is

$$R(x) = 200x - x^2$$

and the cost function is

$$C(x) = 70x + 2200$$

and these equations hold for $0 \leq x \leq 100$, find the break even point.

5. Farmer Linton wants to find the best time to take her hogs to market. The current price is 88 cents per pound and her hogs weigh an average of 90 pounds. The hogs gain 5 pounds per week and the market price for hogs is falling each week by 2 cents per pound. How many weeks should Ms. Linton wait before taking her hogs to market in order to receive as much money as possible? At that time, how much money will she get per hog?

6. A rectangular garden bounded on one side by a river is to be fenced on the other three sides. Fencing material for the side parallel to the river costs \$30 per foot and material for the other two sides costs \$10 per foot. What are the dimensions of the garden of the largest possible area, if \$1200 is to spent for fencing material?
7. If the revenue function for a company is $R(x) = 400x - 2x^2$ and $C(x) = 220x + 2000$, with $0 \leq x \leq 100$, find:
- (a) the break-even point
 - (b) the number of items that need to be sold to maximize the profit
 - (c) the maximum profit
 - (d) the range of sales that will result in a loss?
 - (e) the range of sales that will result in a profit?