Group Assignment #5

APPLICATION OF FUNCTIONS TO ECONOMICS

A bakery opens near campus that delivers fresh baked cookies 24 hours a day. Prior to opening for business, the owner of the bakery bought a recently renovated building to operate out of for $50,000 and an industrial-sized mixer and oven for $3,000. The cost of labor and ingredients depends on the amount of cookie orders the bakery receives. On average, this cost amounts to $4 per dozen cookies ordered.

1) What are the fixed costs, costs incurred even if nothing is produced, for the bakery?

2) What are the variable costs, which depend on how many units are produced for the bakery?

3) Use the values from questions #1 and #2 to construct a formula for the cost function, C(q). Note that the cost function is linear and can be written in slope-intercept form.

4) Use the formula in question #3 to answer the following:
   a. How much will it cost the bakery to make 756 cookies?

   b. How many dozens of cookies does the bakery have to make for costs to amount to $67,232?
5) The bakery owner has decided to sell the cookies for $9 per dozen cookies. Construct a formula for the revenue function, \( R(q) \). *Note that the revenue function is also linear and can be written in slope-intercept form.*

6) Use the formula in question #5 to answer the following:
   a. How much money will the bakery get for selling 942 cookies?
   
   b. In order to get revenue of $78,300, how many dozens of cookies does the bakery need to sell?

7) In the space below, graph both the cost function and the revenue function using an appropriate scale.

8) At what point do the two functions intersect?
9) Given that \( \text{Profit} = \text{Revenue} - \text{Costs} \), construct a formula for the profit function, \( P(q) \).

10) In the space below, graph the profit function using an appropriate scale.

11) Use the formula in question #7 to answer the following:
   
   a. How many dozens of cookies does the bakery need to sell in order to \textit{breakeven} (make a profit of $0)? \textit{This number should look familiar.}

   b. The bakery owner is contemplating raising his prices in order to make a profit of at least $10,000 by the end of the second year of business. If he anticipates selling 7,000 dozen cookies per year, will the bakery owner reach his goal with the current price of cookies? Would you recommend that he raise his prices in order to meet this goal?
12) Create a graph representing your demand for orders of a dozen cookies delivered to your home as a function of the price of one dozen cookies.

13) Using the supply graph drawn on the board and your demand graph, find the equilibrium price (where the two graphs intersect). What do you think the equilibrium price represents?

Suggested Homework Problems

Sec. 1.4: 2, 4, 9, 10, 12, 14, 23, 24