Quadratic Applications

Supply, Demand, Equilibrium

Example 1: If the supply function for a commodity is given by $p = 150 - 6q^2$ and the demand function is given by $p = 10q^2 + 2q$, find the point of market equilibrium.

Example 2: If the demand function for a commodity is given by $p(q + 4) = 400$ and the supply function is given by $2p - q - 38 = 0$, find the market equilibrium.

Cost, Revenue, Profit

Example 3: Suppose that in a monopoly market the total cost per week of producing a high-tech product is given by $C(x) = 3600 + 100x + 2x^2$. Suppose further that the sales price function for this product is $p = 500 - 2x$.

a. Find the revenue function

b. Find the number of units that will give break-even for the product

c. Find the profit function

d. Find the maximum profit and the number of products need to maximize the profit.

e. Graph the profit function and label the vertex, *x*-intercepts, and *y*-intercept.

Example 4: An independent consultant has found that x clients demand their services when they charge a monthly price of $p(x) = -20x + 1400$ dollars. Their costs can be described by a linear cost function with fixed monthly costs of $2000 and a variable monthly cost of $360 per client.

a. Find the monthly revenue function

b. Find the monthly cost function

c. Find the number of clients that will give break-even for the consultant

d. Find the monthly profit function

e. Find the number of clients that will maximize the profit and the maximum profit.

f. Graph the profit function and label the vertex, *x*-intercepts, and *y*-intercept.

Example 5: Given the revenue function: $R(x) = -4x^2 + 1200x$,

a. Find the units to achieve maximum sales revenue and the maximum sales revenue

b. Find the selling price when revenue is maximized

c. Graph the revenue function and label the vertex, *x*-intercepts, and *y*-intercept.

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Example 7: On a certain route, an airline carries 8000 passengers per month, each paying $50. A market survey indicates that for each $1 increase in the ticket price, the airline will lose 100 passengers.

a. What is the airline's current revenue?

b. Create an income (revenue) function if "x" is defined as the number of $1 price increases

c. Find the number of $1 price increases that will maximize the revenue.

d. Find the new ticket price

e. Find the number of passengers

f. Find the new maximum income

Example 8: An apartment building contains 80 units and all are rented at the monthly charge of $700. Management is considering a series of $25 rent increases and knows that for every $25 rent increase, 1 less apartment is occupied.

a. What is the management's current revenue?

b. Create an income (revenue) function if "x" is defined as the number of $25 rent increases

c. Find the number of $25 rent increases that will maximize the income.

d. Find the new rental charge

e. Find the number of apartments that will be rented under this new charge

f. Find the new maximum income

Example 9: An amusement park charges $8 admission and averages 2000 visitors per day. A survey shows that for each $1 increase in the admission price, 100 fewer people would visit the park.

a. What is the amusement park's current revenue?

b. Create an income (revenue) function if "x" is defined as the number of $1 admission price increases

c. Find the number of $1 admission price increases that will maximize the income.

d. Find the new admission price

e. Find the new number of visitors per day

f. Find the new maximum income