Business Applications of Quadratic Functions.

2.3q
1/2

Supply and Demand

Ex1: Find market equilibrium.

$S: p = q^2 + 8q + 16$

$D: p = 216 - 2q$

Why limit results to quadrant I?

Ex2: $S: p = q^2 + 8q + 22$

$D: p = 198 - 4q - \frac{1}{4}q^2$

Ex3: $D: p^2 + 4q = 1600$

$S: 300 - p^2 + 2q = 0$

Let x = 1000's of units.

Ex4: Find equilibrium given that a tax of \$12.50 is placed on the supplier & then passed on to the consumer.

$S: p = \frac{q + 50}{2}$ and $D: p = \frac{100 + 20q}{q}$

Ex5: If a firm has the following cost and revenue functions, find the breakeven points.

$C(x) = 3600 + 25x + \frac{1}{2}x^2$ & $R(x) = \left(175 - \frac{1}{2}x\right)x$

<u>Ex 6</u>: Boeing finds that the cost to build x B2 bombers can be modelled by $C(x) = 150 + x + 0.09x^2$ (in mil. of \$). The revenue from the sale of x bombers is $R(x) = 12.5x - 0.01x^2$. Furthermore, Boeing plans to build at most 75 B2s.

a) What is the domain of $C(x)$.

b) Find the break-even point(s).

c) find the profit fct $P(x)$.

d) Interpret $P(x)$

e) What should Boeing do to max profit.

Ex2: Find max profit (in groups)

If $C(x) = 120x + 15000$

$R(x) = 370x - x^2$

Ex3: A company has fixed costs of \$400 and variable costs of $\frac{1}{2}x + 1000$ dollars per unit.
Find $C(x)$.

Ex4: x = # of units sold.

fixed cost = \$28000

variable costs = $\frac{2}{5}x + 222$ per unit

selling price = $1250 - \frac{3}{5}x$ per unit

a) Find $C(x)$ & $R(x)$

b) Find the breakeven point(s)

c) max profit.

Boeing and the B2 Bomber

Boeing finds that the cost to build n B2 bombers can be modeled by $C(n)=150+n+0.09n^2$ (in millions of dollars). The revenue is modeled by $R(n)=12.5n-0.01n^2$. Furthermore, Boeing plans to build at most 75 B2's.

a.) What is the domain of $C(n)$?

b.) Find the break-even point(s).

c.) Find the profit function $P(n)$.

d.) Interpret $P(n)$.

e.) What should Boeing do to maximize its B2 manufacturing profit?

2.3: Applications of Quadratics to Business
Math 111

Objective:

- Profit, Revenue, and Cost with **Quadratics**

TOOLS FOR CONSTRUCTING

Revenue = (selling price) $\cdot\ x$ where x is the number of units sold

Costs = (variable cost) $\cdot\ x$ **+ fixed cost** where x is the number of units produced

PROFIT = (Revenue) – (Cost)

COMPETITIVE MARKET	MONOPOLY MARKET
coffee stand	miracle medicine.
↳ price determined by market	↳ price determined by company.

TOOLS FOR ANALYZING

MAXIMIZE, use VERTEX $x = -\frac{b}{2a}$ is the units, then evaluate the function to find max $$$.

BREAKEVEN: R = C

R – C = 0 then use the quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

1. In a monopoly market, the demand for a product is $p = 1600 - x$ where x is the number of units sold.

Demand.

a. Find the Revenue function

$R(x) = p \cdot x = (1600 - x) \cdot x = 1600x - x^2.$

b. Find the maximum Revenue and the number of units sold that will maximize Revenue.

$x = -\frac{b}{2a} = -\frac{1600}{2(-1)} = 800.$

$R(800) = 640{,}000$

The max revenue is $640,000 when 800 units are sold.

c. Find the price that will maximize revenue.

$p = 1600 - x$ @ $x = 800$

$\Rightarrow p = 800.$

The price that maximizes revenue is $800/unit.

2.3: Applications of Quadratics to Business
Math 111

Objective:

- Profit, Revenue, and Cost with **Quadratics**

TOOLS FOR CONSTRUCTING

Revenue = (selling price) $\cdot\ x$ where x is the number of units sold

Costs = (variable cost) $\cdot\ x$ **+ fixed cost** where x is the number of units produced

PROFIT = (Revenue) – (Cost)

COMPETITIVE MARKET

MONOPOLY MARKET

TOOLS FOR ANALYZING

MAXIMIZE, use VERTEX $x = -\frac{b}{2a}$ is the units, then evaluate the function to find max $$$.

BREAKEVEN: R = C

R – C = 0 then use the quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

1. In a monopoly market, the demand for a product is $p = 1600 - x$ where x is the number of units sold.

a. Find the Revenue function

b. Find the maximum Revenue and the number of units sold that will maximize Revenue.

c. Find the price that will maximize revenue.