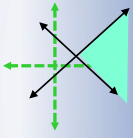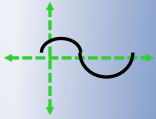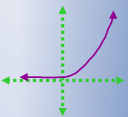$5x-2y \leq 75$

$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$
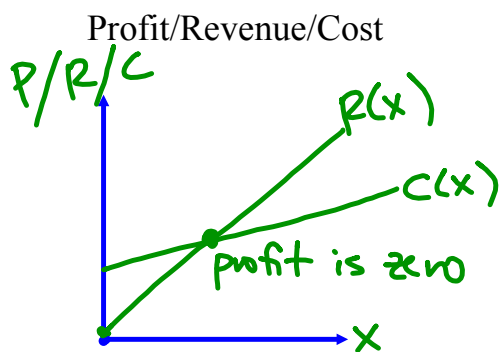
$S = Pe^{rt}$

$APY = (1+\frac{r}{n})^{n}-1$

Math 1090 ~ Business Algebra

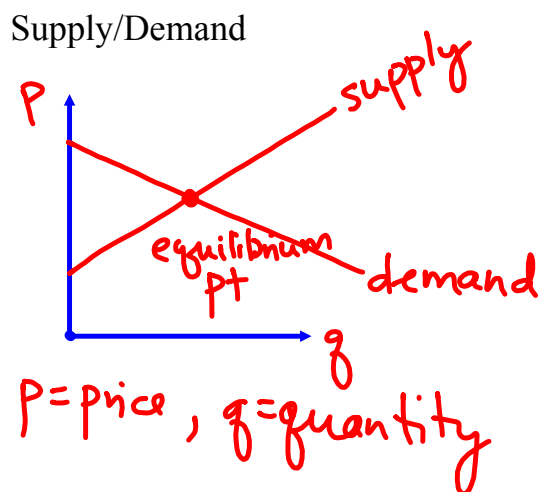### Section 1.6 Linear Business Applications

Objectives:
- Set up and solve Profit/Revenue/Cost application problems.
- Set up and solve Supply/Demand problems.

There are two main types of linear business applications.

Profit/Revenue/Cost

$P/R/C$

$R(x)$

$C(x)$

profit is zero

x

x = # of products
produced and
sold

$P = R - C$

Supply/Demand

P

supply

equilibrium
pt

demand

q

P = price, q = quantity

Ex 1: Market research has shown for a sporting event, supply for tickets is $200p - q = 100$ and demand is $4p = 6528 - 5q$.

a) How many tickets will be purchased if the price is $30? $10?

demand: $4p = 6528 - 5q$

$5q = 6528 - 4p$

$q = \frac{1}{5}(6528 - 4p)$

$P = 30, \quad q = \frac{1}{5}(6528 - 4(30))$
$= 1281.6 \simeq 1282$

$P = 10, \quad q = \frac{1}{5}(6528 - 4(10))$
$= 1297.6$
$\simeq 1298$

b) How many tickets will the sponsors of the event be willing to sell if the ticket price is $30? $10?

supply: $200p - q = 100$

$200p - 100 = q$

$P = 30, \quad q = 200(30) - 100$
$q = 5900$

$P = 10, \quad q = 200(10) - 100$
$= 1900$

c) What is the equilibrium point for this market?

when supply + demand are same

dem. ① $q = \frac{1}{5}(6528 - 4p)$

sup. ② $q = 200p - 100$

$5\left(\frac{1}{5}(6528 - 4p)\right) = (200p - 100)5$

$6528 - 4p = 1000p - 500$

$7028 = 1004p$

$7 = p$

② $q = 200(7) - 100 = 1300$

equilibrium pt

(q, p)

$= (1300, \$7)$

$x =$ # of cookbooks produced & sold

Ex 2: Fixed costs are \$92,880 to publish a certain cookbook and variable costs are \$2.10 per book. The books sell for \$15 each.

a) How many books must be sold to break even? when $P = 0$?

$$R = 15x$$

$$C = 92,880 + 2.10x$$

$$P = R - C = 15x - (92880 + 2.1x)$$

$$15x - 92880 - 2.1x = 0$$

$$12.9x = 92880$$

$$x = \boxed{7200}$$

b) What is <u>marginal revenue</u>? (MR)

how much extra revenue do we bring in from sale of one extra book; slope of revenue curve

$$MR = 15$$

c) What is <u>marginal profit</u>? (MP)

$$MP = 12.9 \qquad P = 12.9x - 92880$$

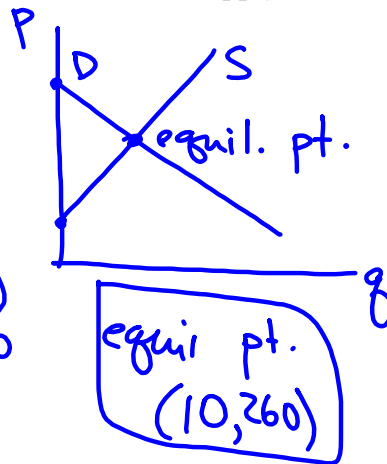Ex 3: Find the market equilibrium point for these demand and supply curves.

demand: $p = -4q + 300$ ①

supply: $p = 21q + 50$ ②

use substitutn:

$-4q + 300 = 21q + 50$ | ① $p = -4(10)$

$250 = 25q$ | $+300$

$10 = q$ | $= 260$

equi pt.
$(10, 260)$

Ex 4: A distributor will supply 10,000 calendars if the price is $2.00 each, or will supply 8,000 calendars if the price is $1.25. What is the supply equation?

(q, p) two pts on supply curve:

$(10000, 2)$
$(8000, 1.25)$

slope $= m = \dfrac{2 - 1.25}{10000 - 8000} = \dfrac{0.75}{2000} \left(\dfrac{100}{100}\right)$

$= \dfrac{75}{200{,}000} = \dfrac{3}{8000}$

pt $(10000, 2)$

$P - 2 = \dfrac{3}{8000}(q - 10000)$ (using pt-slope form of line)

$P - 2 = \dfrac{3}{8000}q - \dfrac{30}{8}$

$P = \dfrac{3}{8000}q - \dfrac{15}{4} + 2$

$\boxed{P = \dfrac{3}{8000}q - \dfrac{7}{4}}$ supply eqn.