1.5 Linear Business Applications

Two Main Types

Profit/Revenue/Cost

\[ p = R - C \]

where \( p \) = price, \( x = \) units produced & sold

Supply/Demand

\[ q = quantity \]

break-even pt \( \Rightarrow \) where profit is zero

\[ (x) \]

Break-even pt \( \Rightarrow \) where profit is zero

equilibrium pt \( \Rightarrow \) where quantity demanded = quantity supplied at a certain price

Example (1): Market research has shown for a sporting event, supply for tickets is \( 20p - q = 100 \) & demand is \( 4p = 6260 - 5q \).

(a) How many tickets will be purchased if price is $30? $100?
Ex 1 (cont)  (b) How many tickets will the sponsors of the event be willing to sell if the ticket price is $30? 100%.

(c) What is the equilibrium pt for this market?
1.5 (cont.)

Ex 2. Fixed costs are $92,000 to publish a certain cookbook and variable costs are $2.10 per book.

(a) If the book sells for $15 each, how many books must be sold to break even?

(b) What is marginal revenue, $MR$?

(c) What is marginal profit, $MP$?
Ex 3 Find market equilibrium pt. for these demand + supply curves.

demand: \( p = -4q + 300 \)
supply: \( p = 2q + 50 \)

Ex 4 (#20) A distributor will supply 10,000 calendars if the price is $2 each or will supply 8,000 calendars if the price is $1.25. What is the supply equation?
1.6 Linear Inequalities in Two Variables

Vocab: Linear Inequality \( \Rightarrow \) can be written in the form \( ax + by < c \), \( a, b, c \in \mathbb{R} \)

Linear system of inequalities \( \Rightarrow \) two or more linear inequalities we want to solve simultaneously.

Solution Set \( \Rightarrow \) the region that solves all inequalities.

Ex 1: Graph solns.

(a) \( 2x - \frac{3}{5}y \geq \frac{2}{5} \)

(b) \( 4x + 3y \leq 9 \)
Ex2  Solve and graph solutions (on 2d plane).

\[ x + y \leq \frac{1}{2} \]
\[ 2x + \frac{3}{4}y \leq 3 \]
\[ \frac{1}{3}x + \frac{1}{2}y \geq -2 \]
\[ \frac{1}{5}y - \frac{2}{3}x \leq 5 \]
Ex. 3  Solve and graph solutions.

\[ x + 7y < -15 \]
\[ 5x - y > -3 \]
\[ x - 2y < 12 \]
Ex 4 (#40) A furniture company makes and sells 2 types of tables, one small and one large. Each large table requires two hours of assembly and two hours of finish work. Each small table requires 3 hours of assembly and \( \frac{1}{2} \) hours of finish work. The assembly shop is open a maximum of 12 hours per day. The finishing shop is available for 10 hours per day. Find the system of linear inequalities to represent this and graph solutions.