Section 1.6: Applications of Functions in Business & Economics

Definitions

* Profit \( P \) = Revenue - Cost

* Revenue \( R \): The amount a company receives from sales.
  
  \[ \text{Revenue} = \text{(Price per unit)} \times (\# \text{ of units}) \]

* Cost \( C \) \{ fixed cost (FC) - stays constant regardless of the \# of units produced. Ex. rent, utilities.  
  variable cost (VC) - changes depending on the \# of units produced.  
  \[ \text{Cost} = \text{FC} + \text{VC} \]

* Marginal profit \( MP \): the slope of the profit function = rate of change in profit with respect to the \# of units produced and sold.

* Marginal cost \( MC \): the slope of the cost function.

* Marginal revenue \( MR \): the slope of the revenue function.

Ex.1 (p.119) Suppose that a firm manufactures MP3 players and sells them for $50 each. The costs incurred in the production and sale of the MP3 players are $200,000 plus $10 for each player produced and sold. Write the profit function for the production and sale of \( x \) player.
Break-Even Analysis

**Definition:** Break-even point is the point where cost and revenue are equal. Can find it by solving the system of equations of $C(x)$ and $R(x)$.

Ex.2 On Example 1, how many units must the manufacture produce to break even.

\[
\begin{align*}
R(x) &= \\
C(x) &= 
\end{align*}
\]

Supply, Demand and Market Equilibrium

* Law of demand: As price ↓, quantity demanded ↑.
  As price ↑, quantity demanded ↓.
* Law of supply: As price ↑, quantity supplied ↑.
  As price ↓, quantity supplied ↓.
* To find the market equilibrium point is to solve the system of demand and supply functions.
Ex.3 (#50) A shoe store owner will buy 10 pairs of a certain shoe if the price is $75 per pair and 30 pairs if the price is $25. The supplier of the shoes is willing to provide 35 pairs if the price is $80 per pair but only 5 pairs if the price is $20. Assuming the supply and demand functions for the shoes are linear, find the market equilibrium point.

Supply and Demand with Taxation

Tax is added to the right-hand side of the supply function given in the form \( p = \cdots \).

If the supply function is not given in the form \( p = \cdots \), you need to change the function to this form before adding the tax.
Ex.4 (#56) Suppose that a certain product has the following demand and supply functions.

Demand: \[2p + 5q = 200\]
Supply: \[2p - 5q = 10\]

If a $10 tax per item is levied on the supplier, who passes it on to the consumer as a price increase, find the market equilibrium point after the tax.