Section 1.5B
Break Even Analysis

When a company neither makes a profit nor sustains a loss this is called the **break-even level of operation**.

**Note:** The break even level of operation is represented by the point of intersection of two lines.

The break even level of production means the profit is zero. This means $P(x) = R(x) - C(x) = 0$, which implies that $R(x) = C(x)$.

Consider the following graph:

The point of intersection above, $(x_o, y_o)$, is referred to as the break-even point.

$x_o = \text{break even quantity} \quad y_o = \text{break even revenue}$

If $x < x_o$ then $R(x) < C(x)$. Hence, $P(x) = R(x) - C(x) < 0$ which indicates a LOSS.

If $x > x_o$ then $R(x) > C(x)$. Hence, $P(x) = R(x) - C(x) > 0$ which indicates a PROFIT.

Example 1: A company has a break-even point of $(1,575, \$125,000)$. If it produces and sells 2,000 units would the company make a profit or sustain a loss? How do you know?

Example 2: A company has a profit function of $P(x) = 32x - 300,000$.
   a. What is the break even quantity?

   b. How many units must the company produce and sell to make a profit of $84,000?
Example 3: Find the break-even quantity and break-even revenue if 
\( C(x) = 32x + 375000 \) and \( R(x) = 62x \)

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\begin{align*}
\text{break-even quantity:} & \quad \text{break-even revenue:} \\
\end{align*}
\]

Example 4: The XYZ Company has a fixed cost of 200,000, a production cost of $12 for each unit produced and a selling price of $20 for each unit produced.

a. Find the break-even point for the company.

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\begin{align*}
\text{break-even quantity:} & \quad \text{break-even revenue:} \\
\end{align*}
\]

b. If the company produces and sells 33,000 units, would it have a profit or loss?

c. If the company produces and sells 40,000 units, what would be the profit?
Example 5: *Iota Airplane Supplier* manufactures a certain airplane part for small airplanes. Each part sells for $250 and the variable cost of producing each unit is 42% of the selling price. The manufacturer’s monthly fixed cost is $638,000. What is the manufacturer’s break-even point?