Section 1.1: Models, Functions and Graphs

Functions
A function is a rule that assigns to each value of \( x \) one and only one value of \( y \).

Example 1
\[
f(x) = x^2 - 1
\]
\[
f(2) =
\]
\[
f(-4) =
\]

Example 2
Pennsylvania sales tax is 6%. This can be written as a linear function in the following way:

\[
T(x) = 0.06x
\]
Where \( T \) is the tax for something that costs \( x \) dollars.
So to find the amount of tax for something that is 4 dollars or 24,000 dollars we would simply find \( T(4) \) or \( T(24,000) \)
\[
T(4) = 0.06 \times 4 = 0.24
\]
\[
T(24,000) = 0.06 \times 24,000 = 1440
\]

Example 3
The value of a piece of land \( v \) is given in thousands of dollars by the following function where \( t \) is in years.
\[
v(t) = (39.4)^2^t
\]
What is the value of the land after 2 years?

What is the value of the land after 6 months?

Vertical Line Test: A graph is a function if when you draw any vertical line through the graph, it passes through at most one place on the graph. If it passes through two or more, it is not a function.
Cost, Revenue, and Profit functions

Cost function: Total cost of manufacturing $x$ units. Need the Variable Costs($V$) and the fixed costs ($F$).

$$C(x) = V(x) + F$$

Revenue function: Total revenue realized from the sale of $x$ units of the product.

$$R(x)$$

Profit function: Total profit realized from manufacturing and selling $x$ units of the product. Simply the difference of the Revenue and the Cost.

$$P(x) = R(x) - C(x)$$

Break Even Point

When the revenue function equals the cost function so that the profit equals zero.

Example 4

A game manufacturer has a fixed cost of $24,000$ and a production cost of $9$ for each game produced. The games sell for $25$.

What is the cost function?

What is the Revenue function?

What is the profit function?

Compute the profit corresponding to a production level of 8000 games.

What is the Break Even Point for this game (in other words how many games would have to be produced and sold for the company to break even?)