

# Functional Models

## Lecture 7 Section 1.4

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# Objectives

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- The general modeling procedure.
- Explore some applied models.
- Market equilibrium and break-even analysis.

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**Testing and Adjustment:** To the extent that the model does not match reality, gather more data, analyze the model, and make adjustments designed to bring the model in closer alignment with reality.

# Maximize Profit

## Example 1.4.1 – Maximize Profit

A manufacturer can produce printer paper at a cost of \$2 per ream. The paper has been selling for \$5 per ream, and at that price consumers have been buying 4,000 reams per month. The manufacturer is planning to raise the price of the paper and estimates that for each \$1 increase in the price, 400 fewer reams will be sold each month.

- (a) What price corresponds to the maximum profit?
- (b) What is the maximum profit?

# Market Equilibrium

## Example 1.4.5 – Market Equilibrium

Market research indicates that manufacturers will supply  $x$  units of a particular commodity to the marketplace when the price is  $p = S(x)$  dollars per unit and that the same number of units will be demanded by consumers when the price is  $p = D(x)$  dollars per unit, where

$$S(x) = x^2 + 14$$

and

$$D(x) = 174 - 6x.$$

- (a) At what level of production is market equilibrium achieved?
- (b) At what price is market equilibrium achieved?



# Break-Even Analysis

## Example 1.4.6 – Break-Even Analysis

Emory's Furniture can sell a luxury reclining chair for  $p = 1500 - 3x$  dollars per unit when  $x$  units are produced and sold, and the total cost of production consists of a fixed overhead of \$66,500 plus \$20 per unit. Plant capacity limits production to no more than 300 units.

- (a) What is the break-even point?
- (b) How many chairs must be sold to realize a profit of \$120,000?