Mini-Lecture 2.6
Mathematical Models: Building Functions

Learning Objectives:

1. Build and analyze functions

Examples:

1. Two cars are approaching an intersection. One is 1 mile south of the intersection and is moving at a constant speed of 40 mph. At the same time, the other car is 2 miles east of the intersection and is moving at a constant speed of 10 mph.
    (a) Express the distance d between the cars as a function of time t.
    (b) For what value of t is d smallest?

2. A rectangle has one corner on the graph of $y = 9 - x^2$, another at the origin, a third on the positive y-axis, and the fourth on the positive x-axis.
    (a) Express the area A as a function of x.
    (b) For what value of x is A the largest?
    (c) What is the domain of A?

3. Let $P = (x, y)$ be a point on the graph of $y = x^2 - 25$.
    (a) Express the distance d from P to the point $(1, 0)$ as a function of x.
    (b) What is d if $x=2$?

Teaching Notes:
- Students do not like word problems, so it is essential that your examples be creative.
- Try to use charts when possible.

Answers:

1. (a) $d = \sqrt{1700t^2 - 120t + 5}$ (b) $t \approx 0.035$ hours

2. (a) $A(x) = 9x - x^3$ (b) $x = \sqrt{3}$ (c) (0,3)

3. (a) $d = \sqrt{x^4 - 49x^2 - 2x + 626}$ (b) 21