Section 3.6
Mathematical Models: Building Functions
OBJECTIVE 1

1. Build and Analyze Functions
EXAMPLE

Finding the Distance from the Origin to a Point on a Graph

Let $P = (x, y)$ be a point on the graph of $y = x^2 - 4$

(a) Express the distance $d$ from $P$ to the origin $O$ as a function of $x$.
(b) What is $d$ if $x = 0$?
(c) What is $d$ if $x = 1$?
(d) What is $d$ if $x = \frac{\sqrt{2}}{2}$?
(e) Use a graphing utility to graph the function $d = d(x), x \geq 0$. Rounded to two decimal places, find the value(s) of $x$ at which $d$ has a local minimum.
A rectangle has one corner in quadrant I 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 \( A \) of the rectangle as a function of \( x \).
(b) What is the domain of \( A \)?
(c) Graph \( A = A(x) \).
(d) For what value of \( x \) is the area largest?
EXAMPLE  Making a Playpen

A manufacturer of children’s playpens makes a square model that can be opened at one corner and attached at right angles to a wall or, perhaps, the side of a house. If each side is 3 feet in length, the open configuration doubles the available area in which the child can play from 9 square feet to 18 square feet. See Figure 85.

Now suppose that we place hinges at the outer corners to allow for a configuration like the one shown in Figure 86.
**EXAMPLE  Making a Playpen**

(a) Express the area \( A \) of this configuration as a function of the distance \( x \) between the two parallel sides.

(b) Find the domain of \( A \).

(c) Find \( A \) if \( x = 5 \).

(d) Graph \( A = A(x) \). For what value of \( x \) is the area largest? What is the maximum area?

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**Figure 85**

**Figure 86**