The Distance Formula

looseleaf.

The Distance Formula The Pythagorean Theorem can be used to derive the Distance Formula shown below. The Distance Formula can then be used to find the distance between any two points in the coordinate plane.

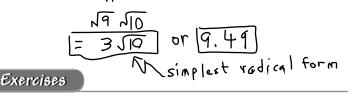
**Distance Formula** 

The distance between any two points with coordinates  $(x_1, y_1)$  and  $(x_2, y_2)$  is given by  $D = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}.$ 

Example 1 Find the distance between the points at (-5, 2) and (4, 5).

$$\begin{array}{l} \mathsf{D} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \text{ Distance Formula} \\ = \sqrt{(4 - (-5))^2 + (5 - 2)^2} \ (\textit{x}_1, \textit{y}_1) = (-5, 2), \ (\textit{x}_2, \textit{y}_2) = (4, 5) \\ = \sqrt{9^2 + 3^2} \\ = \sqrt{81 + 9} \\ = \sqrt{90} \end{array}$$
 Simplify. Evaluate squares and simplify.

The distance is  $\sqrt{90}$ , or about 9.49 units.



Example 2 Jill draws a line segment from point (1, 4) on her computer screen to point (98, 49). How long is the segment?

$$\begin{split} \mathsf{D} &= \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \\ &= \sqrt{(98 - 1)^2 + (49 - 4)^2} \\ &= \sqrt{97^2 + 45^2} \\ &= \sqrt{9409 + 2025} \\ &= \sqrt{11,434} \end{split}$$

The segment is about 106.93 units long.

Find the distance between each pair of points whose coordinates are given. Express answers in simplest radical form and as decimal approximations rounded to the nearest hundredth if necessary.

3. 
$$(-2, -8), (7, -3)$$

$$4. (6, -7), (-2, 8)$$

**6.** 
$$(3, -4), (-4, -4)$$

8. 
$$(0, 0), (-3, 5)$$

**9.** 
$$(2, -6), (-7, 1)$$

**10.** 
$$(-2, -5), (0, 8)$$

**13.** 
$$(1, -1), (3, -2)$$

**15.** 
$$(-9, 0), (-2, 5)$$

**16.** 
$$(2, -7), (-2, -2)$$

**18.** 
$$(-3, -5), (1, -8)$$