**Lesson 8–1**

## Example 1 Find a Midpoint

**Find the midpoint of the line segment with endpoints at (–2, 1.4) and (0, –6.8).**

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right) = \left(\frac{-2 + 0}{2}, \frac{1.4 + (-6.8)}{2}\right)$$ Let $(x_1, y_1) = (-2, 1.4)$ and $(x_2, y_2) = (0, -6.8)$.

$$= \left(-\frac{2}{2}, \frac{-5.4}{2}\right) \text{ or } (-1, -2.7)$$ Simplify.

The midpoint of the line segment with endpoints at (–2, 1.4) and (0, –6.8) is (–1, –2.7).

**Example 2 Find the Distance Between Two Points**

**What is the distance between $C\left(-\frac{3}{4}, \frac{1}{5}\right)$ and $D\left(2, -\frac{3}{5}\right)$.**

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$ Distance Formula

$$= \sqrt{\left[2 - \left(-\frac{3}{4}\right)\right]^2 + \left[-\frac{3}{5} - \frac{1}{5}\right]^2}$$ Let $(x_1, y_1) = \left(-\frac{3}{4}, \frac{1}{5}\right)$ and $(x_2, y_2) = \left(2, -\frac{3}{5}\right)$.

$$= \sqrt{\left(\frac{11}{4}\right)^2 + \left(-\frac{4}{5}\right)^2}$$ Subtract.

$$= \sqrt{\frac{3281}{400}} \text{ or } \frac{\sqrt{3281}}{20}$$ Simplify.

The distance between the points is $\frac{\sqrt{3281}}{20}$ units.

## Example 3 The Closest Point

**Multiple–Choice Test Item**

Which of the following points is closest to (4, –6)?

**A.** (–2, 1) **B.** (0, 0) **C.** (1, –1) **D.** (2, 1)

**Read the Test Item**

The word *closest* refers to the least distance.

**Solve the Test Item**

Use the Distance Formula to find the distance from (4, –6) to each point.

**Distance to (–2, 1)**

$$d = \sqrt{(-2 - 4)^2 + [1 - (-6)]^2}$$
$$= \sqrt{(-6)^2 + 7^2} \text{ or } \sqrt{85}$$

**Distance to (0, 0)**

$$d = \sqrt{(0 - 4)^2 + [0 - (-6)]^2}$$
$$= \sqrt{(-4)^2 + 6^2} \text{ or } 2\sqrt{13}$$

**Distance to (1, –1)**

$$d = \sqrt{(1 - 4)^2 + [-1 - (-6)]^2}$$
$$= \sqrt{(-3)^2 + 5^2} \text{ or } \sqrt{34}$$

**Distance to (2, 1)**

$$d = \sqrt{(2 - 4)^2 + [1 - (-6)]^2}$$
$$= \sqrt{(-2)^2 + 7^2} \text{ or } \sqrt{53}$$

The least distance is $\sqrt{34}$ units. So, the closest point to (4, –6) is (1, –1).
The answer is C.