10-1

Study Guide

Introduction to Analytic Geometry

Example 1 **Find the distance between points at (−2, 2) and (5, −4). Then find the midpoint of the segment that has endpoints at the given coordinates.**

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

$d = \sqrt{[5 - (-2)]^2 + [(-4) - 2]^2}$ *Let* $(x_1, y_1) = (-2, 2)$ *and* $(x_2, y_2) = (5, -4)$.

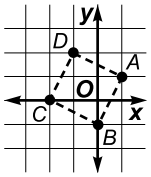
$d = \sqrt{7^2 + (-6)^2}$ or $\sqrt{85}$

midpoint $= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ *Midpoint Formula*

The midpoint is at $\left(\frac{-2 + 5}{2}, \frac{2 + (-4)}{2}\right)$ or $\left(\frac{3}{2}, -1\right)$.

Example 2 **Determine whether quadrilateral *ABCD* with vertices *A*(1, 1), *B*(0, −1), *C*(−2, 0), and *D*(−1, 2) is a parallelogram.**

First, graph the figure.



To determine if $\overline{DA} \parallel \overline{CB}$, find the slopes of $\overline{DA}$ and $\overline{CB}$.

slope of $\overline{DA}$

$m = \frac{y_2 - y_1}{x_2 - x_1}$ *Slope formula*

$= \frac{1 - 2}{1 - (-1)}$ *D(−1, 2) and A(1, 1)*

$= -\frac{1}{2}$

slope of $\overline{CB}$

$m = \frac{y_2 - y_1}{x_2 - x_1}$ *Slope formula*

$= \frac{-1 - 0}{0 - (-2)}$ *C(−2, 0) and B(0, −1)*

$= -\frac{1}{2}$

Their slopes are equal. Therefore, $\overline{DA} \parallel \overline{CB}$.

To determine if $\overline{DA} \cong \overline{CB}$, use the distance formula to find $\overline{DA}$ and $\overline{CB}$.

$DA = \sqrt{[1 - (-1)]^2 + (1 - 2)^2}$
$= \sqrt{5}$

$CB = \sqrt{[0 - (-2)]^2 + (-1 - 0)^2}$
$= \sqrt{5}$

The measures of $\overline{DA}$ and $\overline{CB}$ are equal. Therefore, $\overline{DA} \cong \overline{CB}$.

Since $\overline{DA} \parallel \overline{CB}$ and $\overline{DA} \cong \overline{CB}$, quadrilateral *ABCD* is a parallelogram.