



# Chapter 10 Analytic Geometry

# 10.3

## Preparing to Do Analytic Proofs

# Preparing to Do Analytic Proofs

In this section, we lay the groundwork for constructing analytic proofs of geometric theorems.

An analytic proof requires the use of the coordinate system and the application of the formulas.

Because of the need for these formulas, a summary follows.

# Preparing to Do Analytic Proofs

Be sure that you have committed to memory these formulas and know when and how to use them.

**TABLE 10.1**

*Formulas of Analytic Geometry*

Distance	$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Midpoint	$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$
Slope	$m = \frac{y_2 - y_1}{x_2 - x_1}$ where $x_1 \neq x_2$
Special relationships for lines	$\ell_1 \parallel \ell_2 \leftrightarrow m_1 = m_2$ $\ell_1 \perp \ell_2 \leftrightarrow m_1 \cdot m_2 = -1$ , where neither $\ell_1$ nor $\ell_2$ is a vertical line or a horizontal line.

# Example 1

Suppose that you are to prove the following relationships:

- a)** Two lines are parallel.
- b)** Two lines are perpendicular.
- c)** Two line segments are congruent.

Which formula(s) from Table 10.1 would you need to use?

How would you complete your proof?

## Example 1 – *Solution*

- a) Use the Slope Formula to find the slope of each line.  
Then show that the slopes are equal.
  
- b) Use the Slope Formula to find the slope of each line.  
Then show that  $m_1 \cdot m_2 = -1$ .
  
- c) Use the Distance Formula to find the length of each line segment. Then show that the resulting lengths are equal.