12. Given: Points $E(-4, 1)$, $F(2, 3)$, $G(4, 9)$, and $H(-2, 7)$
    a. Show that $EFGH$ is a rhombus.
    b. Use slopes to verify that the diagonals are perpendicular.
13. Given: Points $R(-4, 5)$, $S(-1, 9)$, $T(7, 3)$ and $U(4, -1)$
    a. Show that $RSTU$ is a rectangle.
    b. Use the distance formula to verify that the diagonals are congruent.
14. Given: Points $N(-1, -5)$, $O(0, 0)$, $P(3, 2)$, and $Q(8, 1)$
    a. Show that $NOPQ$ is an isosceles trapezoid.
    b. Show that the diagonals are congruent.

Decide what special type of quadrilateral *HIJK* is. Then prove that your answer is correct.

15. $H(0, 0)$	$I(5, 0)$	$J(7, 9)$	$K(1, 9)$
16. $H(0, 1)$	$I(2, -3)$	$J(-2, -1)$	$K(-4, 3)$
17. $H(7, 5)$	$I(8, 3)$	$J(0, -1)$	$K(-1, 1)$
18. $H(-3, -3)$	$I(-5, -6)$	$J(4, -5)$	$K(6, -2)$

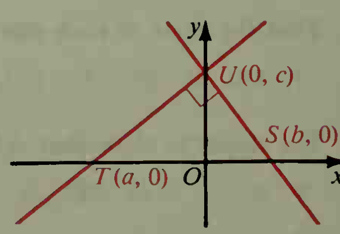
19. Point $N(3, -4)$ lies on the circle $x^2 + y^2 = 25$. What is the slope of the line that is tangent to the circle at N? (*Hint*: Recall Theorem 9-1.)
20. Point $P(6, 7)$ lies on the circle $(x + 2)^2 + (y - 1)^2 = 100$. What is the slope of the line that is tangent to the circle at P?

In Chapter 3 parallel lines are defined as coplanar lines that do not intersect. It is also possible to define parallel lines *algebraically* as follows:

Lines a and b are *parallel* if and only if slope of a = slope of b (or both a and b are vertical).

21. Use the algebraic definition to classify each statement as true or false.
    a. For any line l in a plane, $l \parallel l$.
    b. For any lines l and n in a plane, if $l \parallel n$, then $n \parallel l$.
    c. For any lines k, l, and n in a plane, if $k \parallel l$ and $l \parallel n$, then $k \parallel n$.
22. Refer to Exercise 21. Is parallelism of lines an equivalence relation? (See Exercise 15, page 43.) Explain.

C 23. This exercise shows another way to prove Theorem 13-4.
    a. Use the Pythagorean Theorem to prove:
    If $\overleftrightarrow{TU} \perp \overleftrightarrow{US}$, then the product of the slopes of $\overleftrightarrow{TU}$ and $\overleftrightarrow{US}$ equals -1. That is, prove $\left(-\frac{c}{a}\right) \cdot \left(-\frac{c}{b}\right) = -1$.



    b. Use the converse of the Pythagorean Theorem to prove:
    If $\left(-\frac{c}{a}\right) \cdot \left(-\frac{c}{b}\right) = -1$, then $\overleftrightarrow{TU} \perp \overleftrightarrow{US}$.