CHAPTER 3

Vocabulary

The table contains important vocabulary terms from Chapter 3. As you work through the chapter, fill in the page number, definition, and a clarifying example.

Term	Page	Definition	Clarifying Example
alternate exterior angles			
alternate interior angles			
distance from a point to a line			
parallel lines			
parallel planes			
perpendicular lines			
point-slope form			

CHAPTER 3

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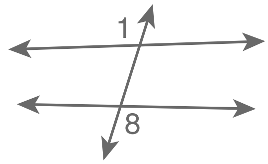
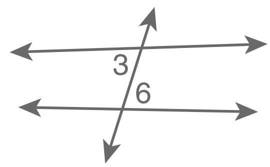
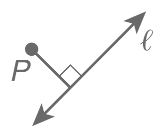
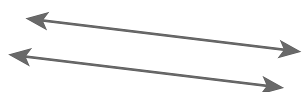
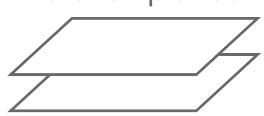
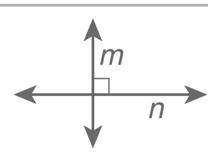
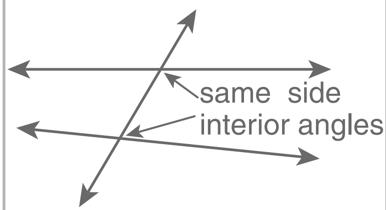
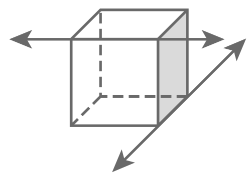
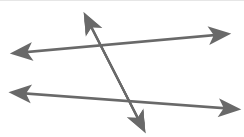
The table contains important vocabulary terms from Chapter 3. As you work through the chapter, fill in the page number, definition, and a clarifying example.

Term	Page	Definition	Clarifying Example
alternate exterior angles	147	**For two lines intersected by a transversal, a pair of angles that lie on opposite sides of the transversal and outside the other two lines.**	 ∠1 and ∠8 are alternate exterior angles
alternate interior angles	147	**For two lines intersected by a transversal, a pair of nonadjacent angles that lie on opposite sides of the transversal and between the other two lines.**	 ∠3 and ∠6 are alternate interior angles
distance from a point to a line	172	**The length of the perpendicular segment from the point to the line.**	
parallel lines	146	**Lines in the same plane that do not intersect.**	Parallel lines 
parallel planes	146	**Planes that do not intersect.**	Parallel planes 
perpendicular lines	146	**Lines that intersect at 90° angles.**	
point-slope form	190	$y - y_1 = m(x - x_1)$, **where** m **is the slope and** $(x_1 - y_1)$ **is a point on the line.**	**slope** $= \frac{5}{2}$; $(-3, 0)$ $y - y_1 = m(x - x_1)$ $y - 0 = \frac{5}{2}[x - (-3)]$ $y - 0 = \frac{5}{2}(x + 3)$

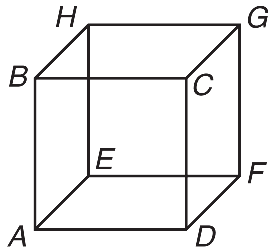
Term	Page	Definition	Clarifying Example
rise			
run			
same-side interior angles			
skew lines			
slope			
slope-intercept form			
transversal			

Term	Page	Definition	Clarifying Example
rise	182	**The difference in the *y*-values of two points on a line.**	**For the points (3, −1) and (6, 5), the rise is $5 - (-1) = 6$.**
run	182	**The difference in the *x*-values of two points on a line.**	**For the points (3, −1) and (6, 5), the run is $6 - 3 = 3$.**
same-side interior angles	147	**For two lines intersected by a transversal, a pair of angles that lie on the same side of the transversal and between the two lines.**	
skew lines	146	**Lines that are not coplanar.**	
slope	182	**A measure of the steepness of a line. If (x_1, y_1) and (x_2, y_2) are any two points on the line, the slope of the line, known as *m*, is represented by the equation $m = \frac{y_2 - y_1}{x_2 - x_1}$.**	**The slope of the line that contains points (2, 3) and (1, 1) is 2.** $\text{Slope} = \frac{\text{rise}}{\text{run}} = \frac{1-3}{1-2} = \frac{-2}{-1} = 2$
slope-intercept form	190	**The slope-intercept form of a linear equation is $y = mx + b$, where *m* is the slope and *b* is the *y*-intercept.**	**$y = -2x + 4$ The slope is −2. The *y*-intercept is 4.**
transversal	147	**A line that intersects two coplanar lines at two different points.**	

Chapter Review

3-1 Lines and Angles

Identify each of the following.



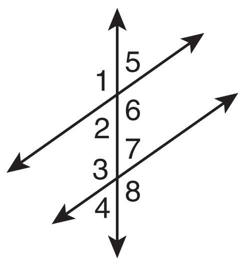
1. a pair of parallel segments

2. a pair of perpendicular segments

3. a pair of skew segments

4. a pair of parallel planes

Give an example of each angle pair.



5. alternate interior angles

6. corresponding angles

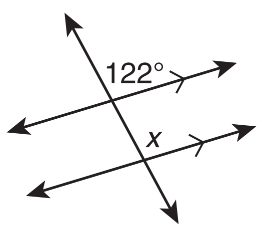
7. alternate exterior angles

8. same-side interior angles

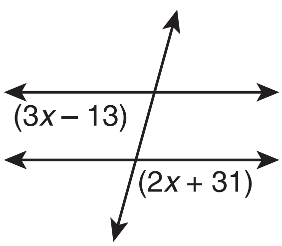
3-2 Angles Formed by Parallel Lines and Transversals

Find each angle measure.

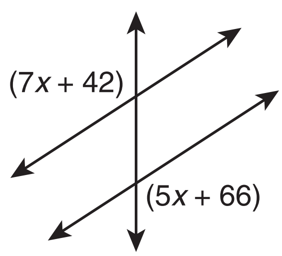
9.



10.



11.

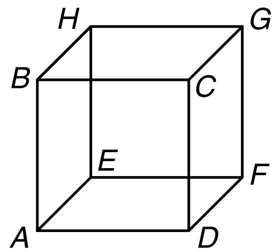


CHAPTER 3

Chapter Review

3-1 Lines and Angles

Identify each of the following.



1. a pair of parallel segments

Sample answer: BC and AD

2. a pair of perpendicular segments

Sample answer: AB and BC

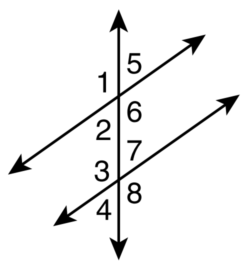
3. a pair of skew segments

Sample answer: AE and CD

4. a pair of parallel planes

Sample answer: plane BHGC and plane AEFD

Give an example of each angle pair.



5. alternate interior angles

∠2 and ∠7, ∠6 and ∠3

6. corresponding angles

∠1 and ∠3, ∠2 and ∠4, ∠5 and ∠7, ∠6 and ∠8

7. alternate exterior angles

∠1 and ∠8, ∠4 and ∠5

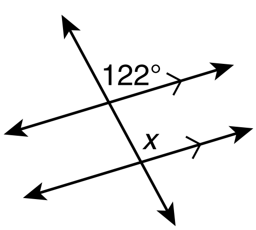
8. same-side interior angles

∠2 and ∠3, ∠6 and ∠7

3-2 Angles Formed by Parallel Lines and Transversals

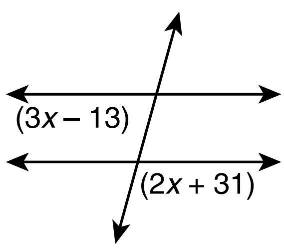
Find each angle measure.

9.



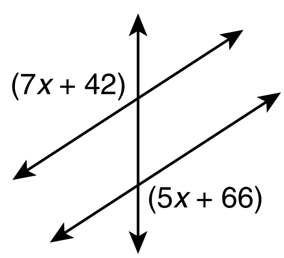
122°

10.



119°

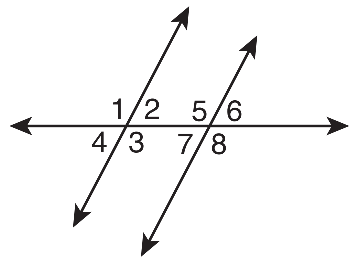
11.



126°

3-3 Proving Lines Parallel

Use the given information and the theorems and postulates you have learned to show that a || b.



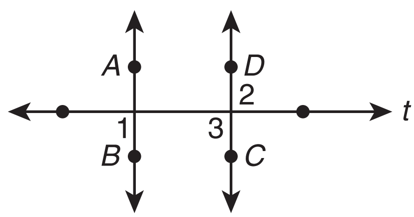
12. $m\angle 2 = m\angle 7$

13. $m\angle 3 \times m\angle 7 = 180°$

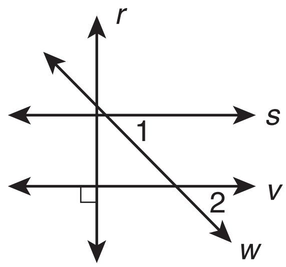
14. $m\angle 4 = (4x + 34)°$,
$m\angle 7 = (7x - 38)°$, $x = 24$

15. $m\angle 1 \cong m\angle 5$

16. If $\angle 1 \cong \angle 2$, write a paragraph proof to show that $\overline{DC} \parallel \overline{AB}$.



3-4 Perpendicular Lines



17. Complete the two-column proof below.

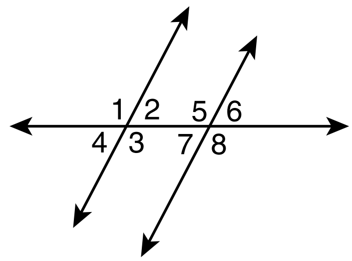
Given: $r \perp v$, $\angle 1 \cong \angle 2$

Prove: $r \perp s$

Statements	Reasons
1. $r \perp v$, $\angle 1 \cong \angle 2$	1. Given
2. $s \parallel v$	2.
3. $r \perp s$	3.

3-3 Proving Lines Parallel

Use the given information and the theorems and postulates you have learned to show that a $\parallel$ b.



12. $m\angle 2 = m\angle 7$ Converse of Alternate Interior Angles Theorem

13. $m\angle 3 \times m\angle 7 = 180°$ Same-side interior angles have a sum of 180 degrees.

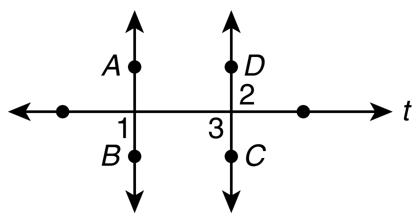
14. $m\angle 4 = (4x + 34)°$, $m\angle 7 = (7x - 38)°$, $x = 24$

Corresponding angles are congruent.

15. $m\angle 1 \cong m\angle 5$

Corresponding angles are congruent.

16. If $\angle 1 \cong \angle 2$, write a paragraph proof to show that $\overline{DC} \parallel \overline{AB}$.



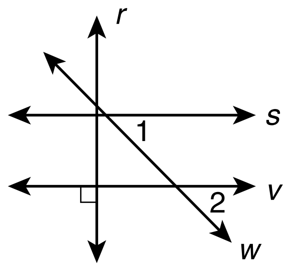
It is given that $\angle 1 \cong \angle 2$, and since vertical angles are congruent, $\angle 2 \cong \angle 3$. By the transitive property, $\angle 1 \cong \angle 3$ and therefore $\overline{DC} \parallel \overline{AB}$ because when two lines are cut by a transversal, and corresponding angles are congruent, the lines are parallel (corresponding angles congruent postulate).

3-4 Perpendicular Lines

17. Complete the two-column proof below.

Given: $r \perp v$, $\angle 1 \cong \angle 2$

Prove: $r \perp s$



Statements	Reasons
1. $r \perp v$, $\angle 1 \cong \angle 2$	1. Given
2. $s \parallel v$	2. Converse of corresponding angles are congruent
3. $r \perp s$	3. Perpendicular transversal theorem

3-5 Slopes of Lines

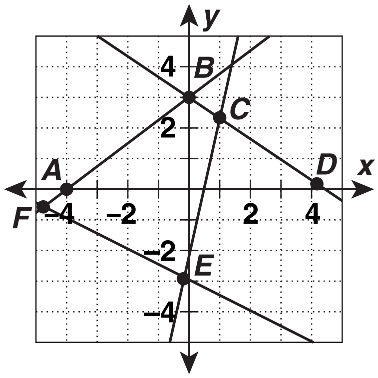
Use the slope formula to determine the slope of each line.

18. $\overleftrightarrow{CE}$

19. $\overleftrightarrow{AB}$

20. $\overleftrightarrow{EF}$

21. $\overleftrightarrow{DB}$



Find the slope of the line through the given points.

22. $R(2, 3)$ and $S(4, 9)$

23. $C(4, 6)$ and $D(8, 3)$

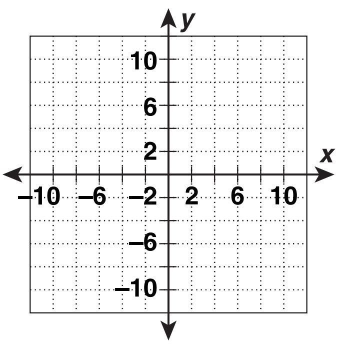
24. $H(-8, 7)$ and $I(2, 7)$

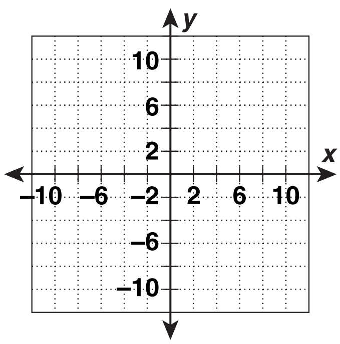
25. $S(4, 0)$ and $T(3, 4)$

Graph each pair of lines and use their slopes to determine if they are parallel, perpendicular, or neither.

26. $\overleftrightarrow{CD}$ and $\overleftrightarrow{AB}$ for $A(3, 6)$, $B(6, 12)$, $C(4, 2)$, and $D(5, 4)$

27. $\overleftrightarrow{LM}$ and $\overleftrightarrow{NP}$ for $L(-6, 1)$, $M(1, 8)$, $N(-1, -2)$, and $P(-3, 0)$





3-5 Slopes of Lines

Use the slope formula to determine the slope of each line.

18. $\overleftrightarrow{CE}$

4

19. $\overleftrightarrow{AB}$

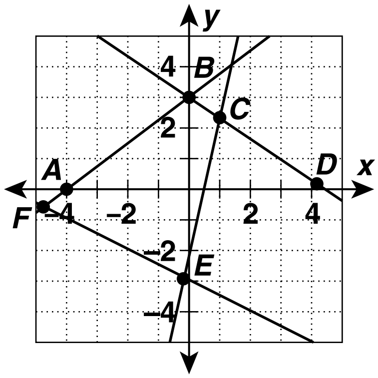
$\frac{3}{4}$

20. $\overleftrightarrow{EF}$

$-\frac{1}{2}$

21. $\overleftrightarrow{DB}$

$-\frac{2}{3}$



Find the slope of the line through the given points.

22. $R(2, 3)$ and $S(4, 9)$ 3

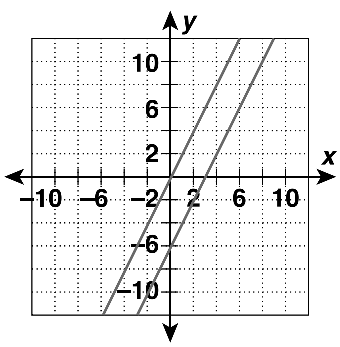
23. $C(4, 6)$ and $D(8, 3)$ $-\frac{3}{4}$

24. $H(-8, 7)$ and $I(2, 7)$ zero

25. $S(4, 0)$ and $T(3, 4)$ -4

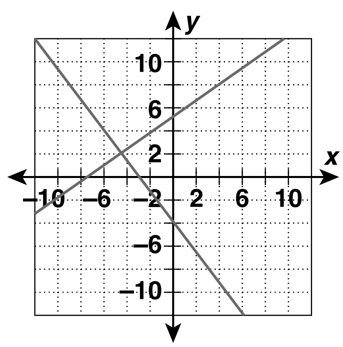
Graph each pair of lines and use their slopes to determine if they are parallel, perpendicular, or neither.

26. $\overleftrightarrow{CD}$ and $\overleftrightarrow{AB}$ for $A(3, 6)$, $B(6, 12)$, $C(4, 2)$, and $D(5, 4)$



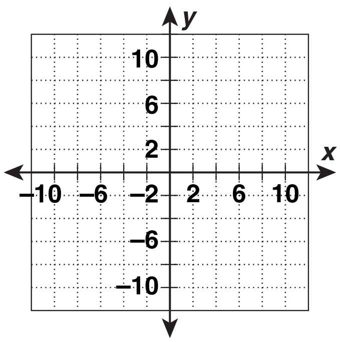
parallel

27. $\overleftrightarrow{LM}$ and $\overleftrightarrow{NP}$ for $L(-6, 1)$, $M(1, 8)$, $N(-1, -2)$, and $P(-3, 0)$

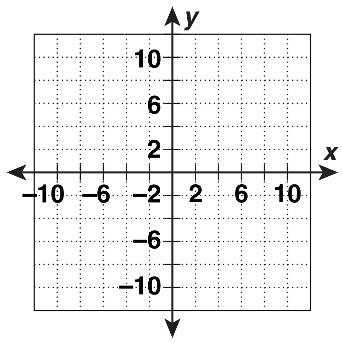


perpendicular

28. $\overleftrightarrow{PS}$ and $\overleftrightarrow{RS}$ for $P(6, 6)$, $Q(5, 7)$, $R(5, -2)$, and $S(7, 2)$



29. $\overleftrightarrow{GH}$ and $\overleftrightarrow{FJ}$ for $F(-5, -4)$, $G(-3, -10)$, $H(-5, 0)$, and $J(-8, -1)$



3-6 Lines in the Coordinate Plane

Write the equation of each line in the given form.

30. the line through $(1, -1)$ and $(-3, -3)$ in slope-intercept form

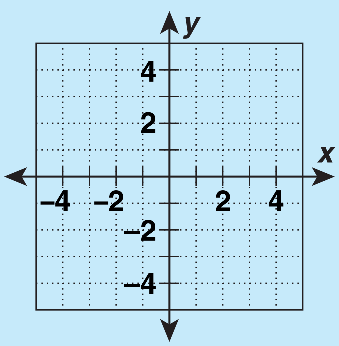
31. the line through $(-5, -6)$ with slope $\frac{2}{5}$ in point-slope form

32. the line with y-intercept 3 through the point $(4, 1)$ in slope-intercept form

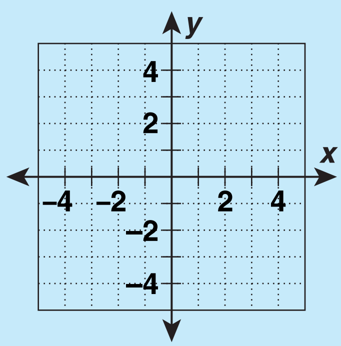
33. the line with *x*-intercept 5 and *y*-intercept –2 in slope-intercept form

Graph each line.

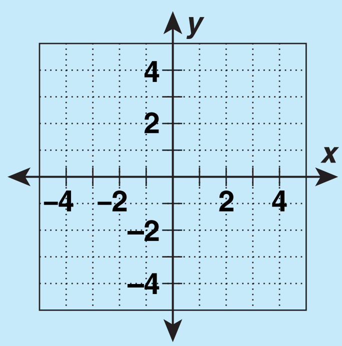
34. $y = -3x + 2$



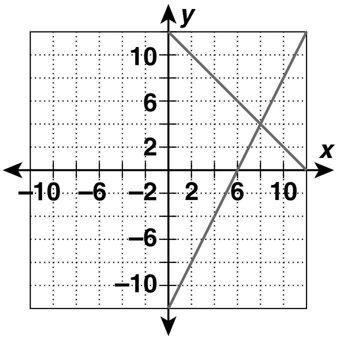
35. $x = 4$



36. $y + 2 = \frac{1}{3}(x - 3)$

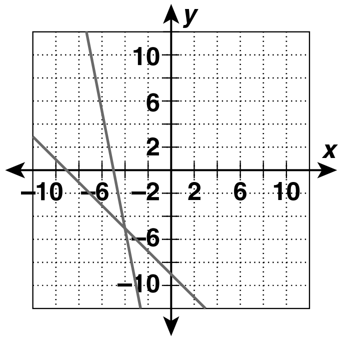


28. $\overleftrightarrow{PS}$ and $\overleftrightarrow{RS}$ for $P(6, 6)$, $Q(5, 7)$, $R(5, -2)$, and $S(7, 2)$



neither

29. $\overleftrightarrow{GH}$ and $\overleftrightarrow{FJ}$ for $F(-5, -4)$, $G(-3, -10)$, $H(-5, 0)$, and $J(-8, -1)$



neither

3-6 Lines in the Coordinate Plane

Write the equation of each line in the given form.

30. the line through $(1, -1)$ and $(-3, -3)$ in slope-intercept form $y = x - 2$

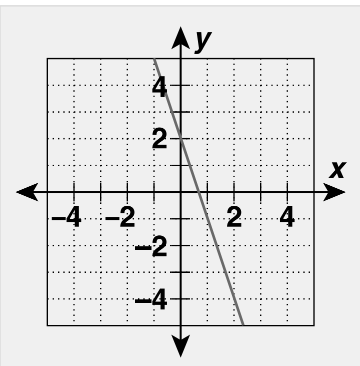
31. the line through $(-5, -6)$ with slope $\frac{2}{5}$ in point-slope form $y + 6 = \frac{2}{5}(x + 5)$

32. the line with y-intercept 3 through the point $(4, 1)$ in slope-intercept form $y = -\frac{1}{2}x + 3$

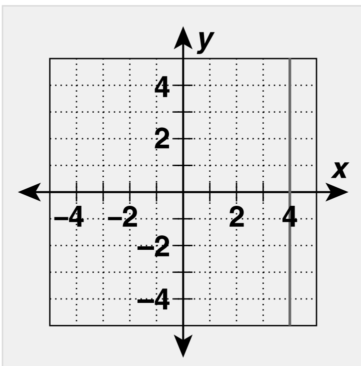
33. the line with x-intercept 5 and y-intercept –2 in slope-intercept form $y = \frac{2}{5}x - 2$

Graph each line.

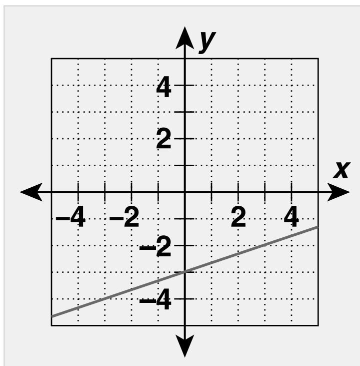
34. $y = -3x + 2$



35. $x = 4$

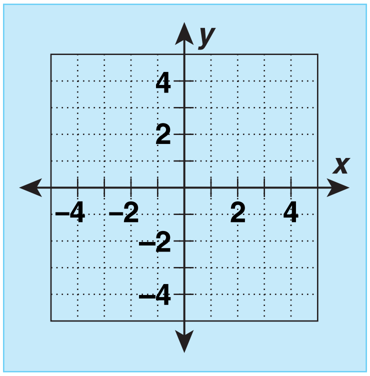


36. $y + 2 = \frac{1}{3}(x - 3)$

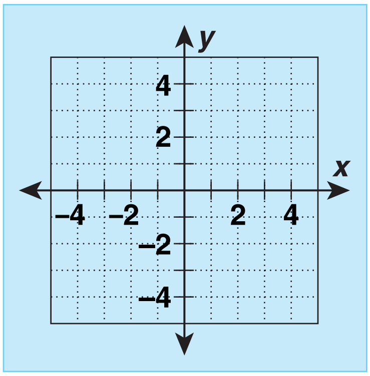


Write the equation of each line.

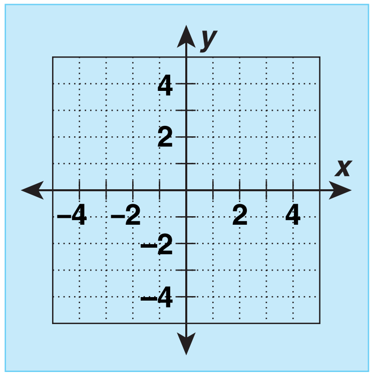
37.



38.



39.



Determine whether the lines are parallel, intersect, or coincide.

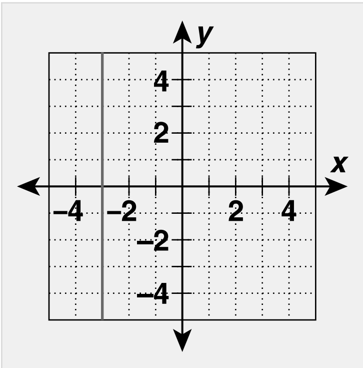
40. $4x + 5y = 10$
$y = -\frac{4}{5}x + 2$

41. $y = -7x + 1$
$y = -7x - 3$

42. $y = 6x - 5$
$4x + 6y = 8$

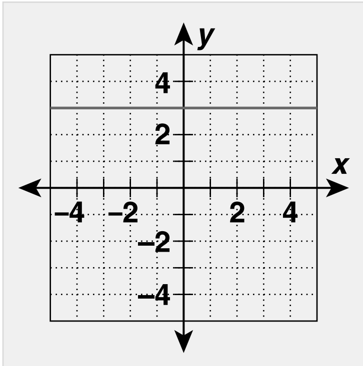
Write the equation of each line.

37.



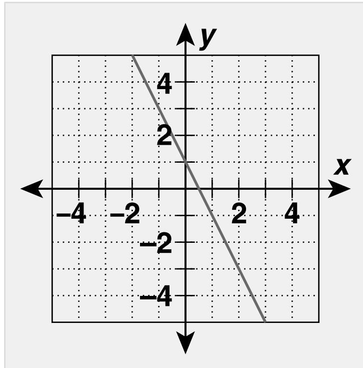
$x = -3$

38.



$y = 3$

39.



$y = -2x + 1$

Determine whether the lines are parallel, intersect, or coincide.

40. $4x + 5y = 10$
$y = -\frac{4}{5}x + 2$

coincide

41. $y = -7x + 1$
$y = -7x - 3$

parallel

42. $y = 6x - 5$
$4x + 6y = 8$

intersect

CHAPTER 3

Postulates and Theorems

Postulate 3-2-1	(Corresponding Angles Postulate) If two parallel lines are cut by a transversal, then the pair of corresponding angles are congruent.
Theorem 3-2-2	(Alternate Interior Angles Theorem) If two parallel lines are cut by a transversal, then the pairs of alternate interior angles are congruent.
Theorem 3-2-3	(Alternate Exterior Angles Theorem) If two parallel lines are cut by a transversal, the two pairs of alternate exterior angles are congruent.
Theorem 3-2-4	(Same-Side Interior Angles Theorem) If two parallel lines are cut by a transversal, then the two pairs of same-side interior angles are supplementary.
Postulate 3-3-1	(Converse of the Corresponding Angles Postulate) If two coplanar lines are cut by a transversal so that the pair of corresponding angles are congruent, then the two lines are parallel.
Postulate 3-3-2	(Parallel Postulate) Through a point P not on line l, there is exactly one line parallel to l.
Theorem 3-3-3	(Converse of the Alternate Interior Angles Theorem) If two coplanar lines are cut by a transversal so that a pair of alternate interior angles are congruent, then the two lines are parallel.
Theorem 3-3-4	(Converse of the Alternate Exterior Angles Theorem) If two coplanar lines are cut by a transversal so that a pair of alternate exterior angles are congruent, then the two lines are parallel.
Theorem 3-3-5	(Converse of the Same-Side Interior Angles Theorem) If two coplanar lines are cut by a transversal so that a pair of same-side interior angles are supplementary, then the two lines are parallel.
Theorem 3-4-1	If two intersecting lines form a linear pair of congruent angles, then the lines are perpendicular.
Theorem 3-4-2	(Perpendicular Transversal Theorem) In a plane, if a transversal is perpendicular to one of two parallel lines, then it is perpendicular to the other line.
Theorem 3-4-3	If two coplanar lines are perpendicular to the same line, then the two lines are parallel.

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Theorem 3-3-3	(Converse of the Alternate Interior Angles Theorem) If two coplanar lines are cut by a transversal so that a pair of alternate interior angles are congruent, then the two lines are parallel.
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Theorem 3-5-1 (Parallel Lines Theorem) In a coordinate plane, two nonvertical lines are parallel if and only if they have the same slope. Any two vertical lines are parallel.

Theorem 3-5-2 (Perpendicular Lines Theorem) In a coordinate plane, two nonvertical lines are perpendicular if and only if the product of their slopes is -1. Vertical and horizontal lines are perpendicular.

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CHAPTER 3

Big Ideas

Answer these questions to summarize the important concepts from Chapter 3 in your own words.

1. Explain the types of angles formed by two coplanar lines and a transversal.

2. Explain slope and how to find it in the coordinate plane.

3. Using slope explain how you can determine if two lines are parallel or perpendicular.

4. Explain one way to graph a line.

For more review of Chapter 3:

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CHAPTER 3

Big Ideas

Answer these questions to summarize the important concepts from Chapter 3 in your own words.

1. Explain the types of angles formed by two coplanar lines and a transversal.

Answers will vary. Possible answer: The types of angles formed are alternate interior, corresponding, alternate exterior and same-side interior. Same-side interior angles have a sum of 90 degrees and the other angles are all congruent.

2. Explain slope and how to find it in the coordinate plane.

Answers will vary. Possible answer: Slope is the change in *y* over the change in *x*, the rise of a graph over the run of a graph. To determine the slope in the coordinate plane you can subtract the *y*-coordinates of two ordered pairs over the difference of the two *x*-coordinates.

3. Using slope explain how you can determine if two lines are parallel or perpendicular.

Answers will vary. Possible answer: Two lines that have the same slope are parallel and two lines whose slopes are negative reciprocals are perpendicular.

4. Explain one way to graph a line.

Answers will vary. Possible answer: One way to graph a line is to plot the *y*-intercept and then graph the slope. For example if the *y*-intercept is 3 and the slope is $\frac{1}{2}$, you would plot (0, 3) and then move up one unit and over two units to the right.

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