Practice Set 4.1
Solving Linear Inequalities

In exercises 1-10, express each interval in set builder notation and graph on a number line.

1. \([-3, 4]\) 
2. \((5, \infty)\) 
3. \((-\infty, 4)\) 
4. \((4, 5)\) 
5. \((-\infty, 3]\) 
6. \((-5, 4]\) 
7. \((-\infty, \infty)\) 
8. \([-5, 4]\) 
9. \((-1, 2)\) 
10. \([-4, 5)\)
In exercises 11-20, solve each linear inequality. Other than Ø, graph the solution set on a number line, and then give answer in interval notation.

11. \(3x + 1 < -11\)  
   \(x < \) 

12. \(2x - 5 > 1\)  
   \(x > \) 

13. \(5x + 3 \geq -12\)  
   \(x \geq \) 

14. \(7x - 2 \leq 12\)  
   \(x \leq \) 

15. \(-4x < 20\)  
   \(x > \) 

16. \(-8x \geq -32\)  
   \(x \leq \) 

17. \(3(2x - 3) > 5(x - 1)\)  
   \(x > \) 

18. \(5(x + 1) - 2 > 2x + 9\)  
   \(x > \) 

19. \(\frac{x}{4} - \frac{3}{8} \geq \frac{x}{2} + \frac{1}{8}\)  
   \(x \geq \) 

20. \(\frac{3x + 2}{4} < \frac{x + 1}{2}\)  
   \(x < \)
Practice Set 4.2
Compound Inequalities

In problems 1-5, find the intersection or union of the sets given.

1. \{2, 4, 6, 8, 10\} \cup \{1, 3, 5, 7, 9\} \\
2. \{2, 4, 6, 8, 10\} \cap \{1, 3, 5, 7, 9\} \\
3. \{0, 1, 2, 3\} \cup \{2, 3, 4, 5\} \\
4. \{0, 1, 2, 3\} \cap \{2, 3, 4, 5\} \\
5. \{a, e, i, o, u\} \cap \{\emptyset\}

Solve each compound inequality. Except for the empty set, express the solution set in both set builder and the interval notation.

6. \(3x \geq 0\) and \(3x + 2 \geq -4\) \\
7. \(-3 < 2 + x < 3\) \\
8. \(-2x - 5 < -3\) or \(6x + 2 < x + 2\) \\
9. \(x \geq -4\) and \(x > 1\) \\
10. \(-3x \leq 6\) and \(-3x + 4 < -5\)
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11.  \[2x \leq 4 \text{ or } 3x + 2 > 2x - 3\]

12.  \[-4 < 4x < 2\]

13.  \[-1 \leq \frac{2x}{3} + 5 \leq 3\]

14.  \[-8 \leq 2x < 8\]

15.  \[x > 2 \text{ and } x < -3\]

16.  \[x + 3 < 8 \text{ and } 3x - 2 < 4\]

17.  \[2x + 4 \leq 10 \text{ and } 6x + 7 > 1\]

18.  \[x + 3 < 0 \text{ and } 2x > -12\]

19.  \[-8 < 3x - 2 \leq 10\]

20.  \[x \geq -2 \text{ and } x \leq 3\]
Practice Set 4.3
Equations and Inequalities Involving Absolute Value

Find the solution for each equation or inequality.

1. \(|x| = 7\)
2. \(|x| = -3\)
3. \(|x| > 5\)
4. \(|x| < -2\)
5. \(||3x + 1|| = ||3x - 1||\)
6. \(||2y - 8|| = 10\)
7. \(||x + 2|| > 7\)
8. \(||3x + 1|| \leq 4\)
9. \(||4x - 1|| = 8\)
10. \(||9x + 4|| = -3\)
11. \(||2x + 3|| = ||x - 4||\)
12. \(||3x + 1|| > -7\)
13. \(\left|\frac{2x + 3}{2}\right| \leq 4\)
Practice Set 4.4
Linear Inequalities in Two Variables

Graph the following.

1. $3x - y < -2$
2. $x + 3y \geq 3$
3. $2x + y \geq -5$
4. $2x - 4y > 4$
5. $y \geq x - 4$
6. $8x - 4y < 4$
7. \[ x \geq 3 \
   y \leq -2 \]

8. \[ y \leq -x + 4 \
   -2x + y \geq 1 \]

9. \[ x + y > 4 \
   x + y < 0 \]

10. \[ 3y < x \
    y > 2x + 1 \]

11. \[ y \leq 4 \
    3x + 4y > 8 \]

12. \[ x - y \leq 2 \
    2x + 4y > 0 \]
Using the graph above for 1-6, find the value of the objective function at:

1. (0, 0)  
2. (0, 5)  
3. (4, 3)  
4. (5, 0)  
5. What is the maximum value of the objective function?  
6. What is the minimum value of the objective function?

Using the graph above for 7-13, find the value of the objective function at:

7. (0, 2)  
8. (0, 0)  
9. (5, 0)  
10. (4, 4)  
11. (3, 5)  
12. What is the maximum value of the objective function?
13. What is the minimum value of the objective function?

Using the graph above for 14-19, find the value of the objective function at:

14. (1, 4)
15. (4, 2)
16. (3, –1)
17. (–2, –1)
18. What is the maximum value of the objective function?
19. What is the minimum value of the objective function?

Using the graph above for 20-25, find the value of the objective function at:

20. (1, 4)
21. (4, 1)
22. (3, –4)
23. (–2, –3)
24. What is the maximum value of the objective function?
25. What is the minimum value of the objective function?
In problems 26-27, an objective function and a system of linear inequalities representing constraints are given.

a. Graph the system of inequalities representing the constraints.
b. Find the value of the objective function at each corner of the graphed region.
c. Use the values in part (b) to determine the maximum value of the objective function and the values of \( x \) and \( y \) for which the maximum occurs.

26. Objective quantity \( z = 3x + 4y \)
   Constraints
   \[ \begin{align*}
   & x \geq 4 \\
   & y \geq 2 \\
   & 3x + 2y \leq 20
   \end{align*} \]

   a. 
   b. _________________________
   c. _________________________

27. Objective quantity \( z = -3x + 3y \)
   Constraints
   \[ \begin{align*}
   & x \geq 0 \\
   & y \geq 0 \\
   & -2x + y \leq 10 \\
   & 4x - y \leq 20 \\
   & 5x + 2y \leq 40
   \end{align*} \]

   a. 
   b. _________________________
   c. _________________________