Exercises 3.2
Set 1

In Exercises 1–4, graph each solution set, and convert the description of each set from set-builder notation to interval notation.

1. $\{x \mid x \geq 5\}$

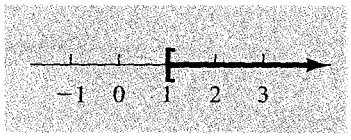
2. $\{x \mid x \leq 2\}$

3. $\{x \mid x < -3\}$

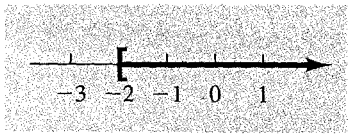
4. $\{x \mid x > -1\}$

In Exercises 5–8, write, in set-builder notation *and* in interval notation, the algebraic statement that describes the set of numbers graphed.

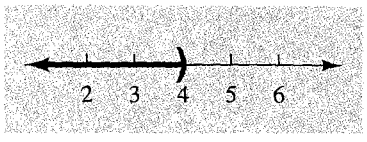
5.



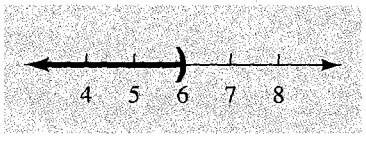
6.



7.



8.



In Exercises 9–24, solve each inequality, describing the solution set *in* set-builder notation *and* in interval notation; graph each solution set.

9. $3x - 1 < 11$

10. $7x - 12 < 30$

11. $17 \geq 2x - 9$

12. $33 \geq 5 - 4x$

13. $2y - 16 > 17 + 5y$

14. $6y + 7 > 4y - 3$

15. $4z - 22 < 6(z - 7)$

16. $8(a - 3) > 15a - 10$

17. $9(2 - 5m) - 4 \geq 13m + 8(3 - 7m)$

18. $18k - 3(8 - 4k) \leq 7(2 - 5k) + 27$

19. $10 - 5x > 2[3 - 5(x - 4)]$

20. $3[2 + 4(y + 5)] < 30 + 6y$

21. $\frac{z}{3} > 7 - \frac{z}{4}$

22. $\frac{t}{5} - 8 > -\frac{t}{3}$

23. $\frac{1}{3} + \frac{w + 2}{5} \geq \frac{w - 5}{3}$

24. $\frac{u - 2}{3} - \frac{u + 2}{4} \geq -\frac{2}{3}$

In Exercises 25 and 26, solve each inequality. Use a calculator, and round off each answer to three decimal places, writing the answer in set-builder notation.

25. $14.73(2.65x - 11.08) - 22.51x \geq 13.94x(40.27)$

26. $1.065 - 9.801x \leq 5.216x - 2.740(9.102 - 7.641x)$

In Exercises 27–30, convert to roster notation, and graph the solution set on the real number line.

27. $\{x \mid x + 3 < 10, x \in N\}$

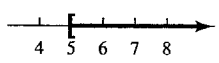
28. $\{x \mid x + 5 < 8, x \in N\}$

29. $\{x \mid 2(x + 3) \leq 11, x \in N\}$

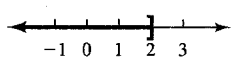
30. $\{x \mid 3(x + 1) \leq 17, x \in N\}$

Exercises 3.2 (page 114)

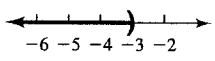
1. $[5, +\infty)$;



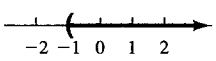
2. $(-\infty, 2]$;



3. $(-\infty, -3)$;



4. $(-1, +\infty)$;



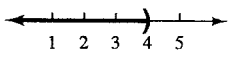
5. $\{x \mid x \geq 1\}$; $[1, +\infty)$

6. $\{x \mid x \geq -2\}$; $[-2, +\infty)$

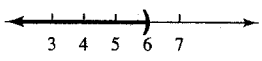
7. $\{x \mid x < 4\}$; $(-\infty, 4)$

8. $\{x \mid x < 6\}$; $(-\infty, 6)$

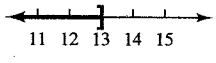
9. $3x - 1 < 11$
$3x < 12$
$x < 4$
$\{x \mid x < 4\}$; $(-\infty, 4)$;



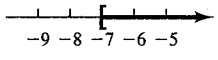
10. $\{x \mid x < 6\}$; $(-\infty, 6)$;



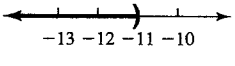
11. $17 \geq 2x - 9$
$26 \geq 2x$
$13 \geq x$
$x \leq 13$
$\{x \mid x \leq 13\}$; $(-\infty, 13]$;



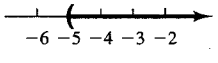
12. $\{x \mid x \geq -7\}$; $[-7, +\infty)$;



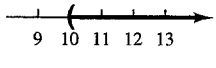
13. $2y - 16 > 17 + 5y$
$-16 > 17 + 3y$
$-33 > 3y$
$-11 > y$
$\{y \mid y < -11\}$; $(-\infty, -11)$;



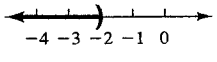
14. $\{y \mid y > -5\}$; $(-5, +\infty)$;



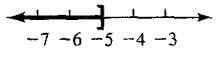
15. $4z - 22 < 6z - 42$
$-22 < 2z - 42$
$20 < 2z$
$10 < z$
$\{z \mid z > 10\}$; $(10, +\infty)$;



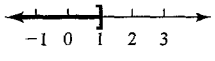
16. $\{a \mid a < -2\}$; $(-\infty, -2)$;



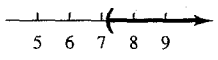
17. $18 - 45m - 4 \geq 13m + 24 - 56m$
$14 - 45m \geq -43m + 24$
$14 \geq 2m + 24$
$-10 \geq 2m$
$-5 \geq m$
$\{m \mid m \leq -5\}$; $(-\infty, -5]$;



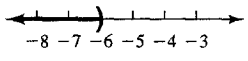
18. $\{k \mid k \leq 1\}$; $(-\infty, 1]$;



19. $10 - 5x > 2[3 - 5x + 20]$
$10 - 5x > 2[23 - 5x]$
$10 - 5x > 46 - 10x$
$10 + 5x > 46$
$5x > 36$
$x > \frac{36}{5}$, or $x > 7\frac{1}{5}$
$\left\{x \mid x > 7\frac{1}{5}\right\}$; $\left(7\frac{1}{5}, +\infty\right)$;



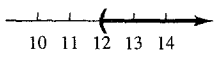
20. $\{y \mid y < -6\}$; $(-\infty, -6)$;



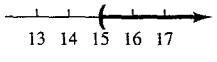
21. LCD = 12

$$\frac{\overset{4}{\cancel{12}}}{1} \cdot \frac{z}{\underset{1}{\cancel{3}}} > \frac{12}{1} \cdot \frac{7}{1} - \frac{\overset{3}{\cancel{12}}}{1} \cdot \frac{z}{\underset{1}{\cancel{4}}}$$

$4z > 84 - 3z$
$7z > 84$
$z > 12$
$\{z \mid z > 12\}$; $(12, +\infty)$;



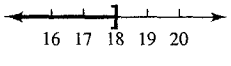
22. $\{t \mid t > 15\}$; $(15, +\infty)$;



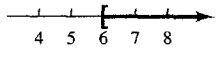
23. LCD = 15

$$\frac{\overset{5}{\cancel{15}}}{1} \cdot \frac{1}{\underset{1}{\cancel{3}}} + \frac{\overset{3}{\cancel{15}}}{1} \cdot \frac{(w+2)}{\underset{1}{\cancel{5}}} \geq \frac{\overset{5}{\cancel{15}}}{1} \frac{(w-5)}{\underset{1}{\cancel{3}}}$$

$5 + 3w + 6 \geq 5w - 25$
$11 \geq 2w - 25$
$36 \geq 2w$
$18 \geq w$, or $w \leq 18$
$\{w \mid w \leq 18\}$; $(-\infty, 18]$;



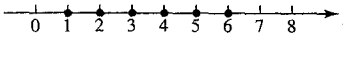
24. $\{u \mid u \geq 6\}$; $[6, +\infty)$;



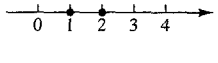
25. $14.73(2.65x - 11.08) - 22.51x \geq 13.94x(40.27)$
$39.0345x - 163.2084 - 22.51x \geq 561.3638x$
$-544.8393x \geq 163.2084$
$x \leq -0.300$ (approx.)
$\{x \mid x \leq -0.300\}$ (approx.)

26. $\{x \mid x \geq 0.723\}$ (approx.)

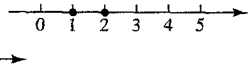
27. $x + 3 < 10$
$x < 7$
$x \in N$
The natural numbers < 7 are 1, 2, 3, 4, 5, and 6.
$\{1, 2, 3, 4, 5, 6\}$;



28. $\{1, 2\}$;



29. $2(x + 3) \leq 11$
$2x + 6 \leq 11$
$2x \leq 5$
$x \leq \frac{5}{2}$
The natural numbers $\leq \frac{5}{2}$ are 1 and 2.
$\{1, 2\}$;



30. $\{1, 2, 3, 4\}$;