3.5 Absolute Value Equations and Inequalities

Basic Concepts Absolute Value Equations Absolute Value Inequalities

Key Terms

Use the vocabulary terms listed below to complete the statements in exercises 1-6.

equation

function

$|ax+b|=|cx+d|$

$|ax+b|=k$

$|ax+b|>k$

$|ax+b|<k$

1. $f(x)=|x|$ is an absolute value _____.

2. $|2x-3|=5$ is an example of an absolute value _____.

3. If $k>0$, then _____ is equivalent to $ax+b=k$ or $ax+b=-k$.

4. Let *a, b, c,* and *d* be constants. Then _____ is equivalent to $ax+b=cx+d$ or $ax+b=-(cx+d)$.

5. Let the solutions to $|ax+b|=k$ be c and d, where $c<d$ and $k>0$. Then _____ is equivalent to $c<x<d$.

6. Let the solutions to $|ax+b|=k$ be c and d, where $c<d$ and $k>0$. Then _____ is equivalent to $x<c$ or $x>d$.

Absolute Value Equations

Exercises 1-15: Solve each equation.

1. $|x| = 16$ **1.** _____

2. $|x| = 0$ **2.** _____

3. $|2w| = -3$ **3.** _____

4. $|-4x| = 12$ **4.** _____

5. $|2x| - 1 = 7$ **5.** _____

6. $|3x - 1| = 14$ **6.** _____

7. $|6 - z| = 5$ **7.** _____

8. $\left|\frac{1}{2}t - 3\right| = 2$ **8.** _____

9. $|-2x+1|+2=4$ **9.** _____

10. $|3+2x|=-4$ **10.** _____

11. $|2x+1|-4=0$ **11.** _____

12. $\left|\frac{1}{2}(x+4)\right|=\frac{1}{4}$ **12.** _____

13. $|3x|=|2-x|$ **13.** _____

14. $|4a-3|=|a+6|$ **14.** _____

15. $\left|\frac{1}{2}x\right|=\left|2-\frac{1}{4}x\right|$ **15.** _____

Absolute Value Inequalities

Exercises 16-21: Solve each absolute value equation or inequality. Write the solution set in interval notation, if possible.

16. $|1-2x|=5$ **16.** _____

17. $|1-2x|\leq 5$ **17.** _____

18. $|1-2x|>5$ **18.** _____

19. $\left|\frac{2x+3}{5}\right|=3$ **19.** _____

20. $\left|\frac{2x+3}{5}\right|<3$ **20.** _____

21. $\left|\frac{2x+3}{5}\right|\geq 3$ **21.** _____

22. A contractor is installing a custom-built window. The width w of the window is to be 32.4 inches and must be accurate to within 0.03 inches. Write an absolute value inequality that gives acceptable values for w.

22. _____

23. An official can operate a stop-watch accurately to within 0.02 second. If a runner's time in the 100-meter dash is recorded as 12.24 seconds, write an absolute value inequality that gives the possible values for the actual time t.

23. _____

24. The inequality $|T - 70| \leq 27$ models the range for the monthly average temperature T in degree Fahrenheit in Houston, Texas. Solve the inequality and interpret the results.

24. _____

Exercises 25-30: Solve each absolute value inequality. Write the solution set in interval notation.

25. $|x| < 5$ **25.** _____

26. $|-2x+6| \geq 8$ **26.** _____

27. $|t+2|-3 \leq 5$ **27.** _____

28. $\left|\frac{3a-2}{4}\right| > -1$ **28.** _____

29. $\left|\frac{3-x}{2}\right| > 3$ **29.** _____

30. $3+\left|\frac{z+1}{2}\right| \leq 4$ **30.** _____