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Name: _____
Date: _____ Class: Math 3 Honors, per: _____

Absolute Value Functions Worksheet & Review

Objective: I can analyze key features of absolute value functions from equations, including domain, range, vertex, intercepts, intervals of increase and decrease, symmetry, and transformations.

For Questions 1–8, analyze each function completely. Fill in every attribute. Remember: absolute value functions have a vertex and usually have no asymptotes.

1. $f(x) = |x|$

a). Domain: _____ b). Range: _____

c). Vertex: _____ d). Axis of symmetry: _____

e). Opens up/down: _____ f). Stretch/compression: _____

g). Transformations: _____

h). x-intercept(s): _____ i). y-intercept: _____

j). Increasing interval: _____ k). Decreasing interval: _____

l). Asymptote(s): _____ m). End behavior: _____

2. $g(x) = |x - 3| + 2$

a). Domain: _____ b). Range: _____

c). Vertex: _____ d). Axis of symmetry: _____

e). Opens up/down: _____ f). Stretch/compression: _____

g). Transformations: _____

h). x-intercept(s): _____ i). y-intercept: _____

j). Increasing interval: _____ k). Decreasing interval: _____

l). Asymptote(s): _____ m). End behavior: _____

3. $h(x) = -2|x + 1| + 4$

a). Domain: _____ b). Range: _____

c). Vertex: _____ d). Axis of symmetry: _____

e). Opens up/down: _____ f). Stretch/compression: _____

g). Transformations: _____

h). x-intercept(s): _____ i). y-intercept: _____

j). Increasing interval: _____ k). Decreasing interval: _____

l). Asymptote(s): _____ m). End behavior: _____

4. $p(x) = 3|x - 2| - 6$

a). Domain: _____ b). Range: _____

c). Vertex: _____ d). Axis of symmetry: _____

e). Opens up/down: _____ f). Stretch/compression: _____

g). Transformations: _____

h). x-intercept(s): _____ i). y-intercept: _____

j). Increasing interval: _____ k). Decreasing interval: _____

l). Asymptote(s): _____ m). End behavior: _____

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5. $q(x) = \frac{1}{2}|x+4| - 3$

a). Domain: _____ b). Range: _____

c). Vertex: _____ d). Axis of symmetry: _____

e). Opens up/down: _____ f). Stretch/compression: _____

g). Transformations: _____

h). x-intercept(s): _____ i). y-intercept: _____

j). Increasing interval: _____ k). Decreasing interval: _____

l). Asymptote(s): _____ m). End behavior: _____

6. $r(x) = -|2x-6| + 5$

a). Domain: _____ b). Range: _____

c). Vertex: _____ d). Axis of symmetry: _____

e). Opens up/down: _____ f). Stretch/compression: _____

g). Transformations: _____

h). x-intercept(s): _____ i). y-intercept: _____

j). Increasing interval: _____ k). Decreasing interval: _____

l). Asymptote(s): _____ m). End behavior: _____

7. $s(x) = 2|x+3| - 1$

a). Domain: _____ b). Range: _____

c). Vertex: _____ d). Axis of symmetry: _____

e). Opens up/down: _____ f). Stretch/compression: _____

g). Transformations: _____

h). x-intercept(s): _____ i). y-intercept: _____

j). Increasing interval: _____ k). Decreasing interval: _____

l). Asymptote(s): _____ m). End behavior: _____

8. $t(x) = -\frac{1}{3}|x-6| - 2$

a). Domain: _____ b). Range: _____

c). Vertex: _____ d). Axis of symmetry: _____

e). Opens up/down: _____ f). Stretch/compression: _____

g). Transformations: _____

h). x-intercept(s): _____ i). y-intercept: _____

j). Increasing interval: _____ k). Decreasing interval: _____

l). Asymptote(s): _____ m). End behavior: _____

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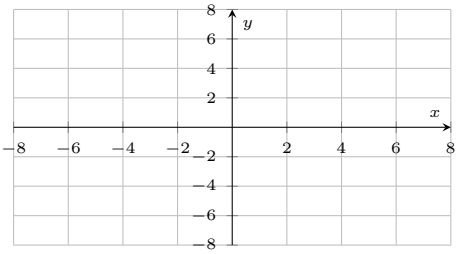
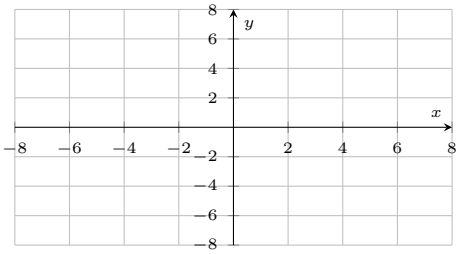
Absolute Value Functions Worksheet & Review

Objective: I can graph absolute value functions and write equations from graphs, tables, vertices, and points.

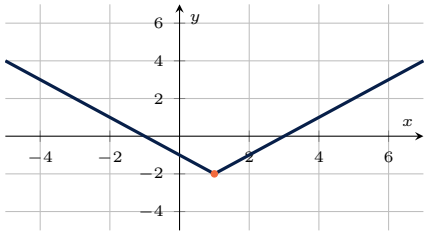
9. Graph $y = |x - 2| - 3$. Then state the vertex, domain, range, x-intercepts, y-intercept, increasing interval, and decreasing interval.



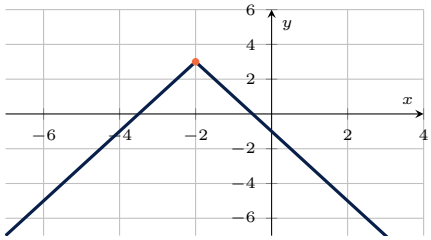
10. Graph $y = -|x + 4| + 1$. Then state the vertex, domain, range, x-intercepts, y-intercept, increasing interval, and decreasing interval.



11. Use the graph to write a possible equation. Then state domain, range, vertex, intercepts, axis of symmetry, increasing interval, and decreasing interval.



12. Use the graph to write a possible equation. Then state domain, range, vertex, intercepts, axis of symmetry, increasing interval, and decreasing interval.



Absolute Value Functions Worksheet & Review

Objective: I can graph absolute value functions and write equations from graphs, tables, vertices, and points.

13. Use the table to write an absolute value equation. Then state the vertex and range.

x	-2	-1	0	1	2
y	6	3	0	3	6

14. Use the table to write an absolute value equation. Then state the vertex and range.

x	-1	0	1	2	3
y	4	2	0	2	4

15. Write an absolute value function with vertex $(4, -5)$ that passes through $(6, 1)$. Then state whether it opens up or down.

16. Write an absolute value function with vertex $(-3, 2)$ that passes through $(1, -6)$. Then state whether it opens up or down.

Objective: I can solve absolute value equations and analyze solution situations, including no solution and extraneous solutions.

17. Solve and check: $|x - 5| = 7$.

18. Solve and check: $|2x + 3| = 9$.

19. Solve and check: $3|x - 4| - 2 = 16$.

20. Solve and check: $-2|x + 1| + 5 = -1$.

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Objective: I can solve absolute value equations and analyze solution situations, including no solution and extraneous solutions.

21. Solve and explain the solution situation: $\|x-3\|+4 = 2$.	**22.** Solve and explain the solution situation: $\|2x-1\| = -5$.
23. Solve: $\|x+2\| = \|3x-6\|$.	**24.** Solve: $\|2x-5\| = \|x+7\|$.
25. Solve and check for extraneous solutions: $\|x-1\| = 2x+5$.	**26.** Solve and check for extraneous solutions: $\|3x+2\| = x-4$.
27. Solve and check: $\|2x-3\|+1 = \|x+6\|$.	**28.** Solve over the real numbers: $\|x^2-4\| = 5$.

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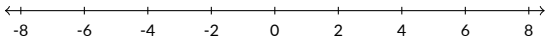
Absolute Value Functions Worksheet & Review

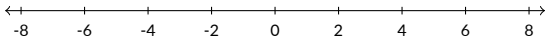
Objective: I can rewrite and solve absolute value inequalities as compound inequalities and graph solution sets on a number line.

For Questions 29–36, solve the inequality and graph the solution set on the number line.

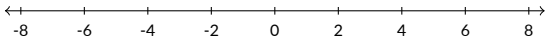
29. $|x - 4| < 6$



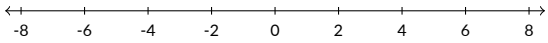
30. $|2x + 1| \leq 9$



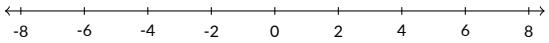
31. $|3x - 5| > 7$



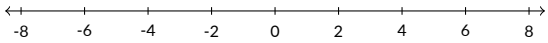
32. $|x + 2| \geq 5$



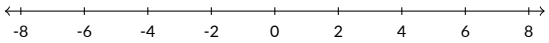
33. $2|x - 1| - 3 < 9$



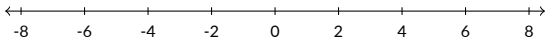
34. $-3|x + 4| + 2 \geq -10$



35. $|x - 5| < -2$



36. $|2x + 3| + 1 > 0$



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Absolute Value Functions Worksheet & Review

Objective: I can apply absolute value equations and inequalities to distance, piecewise definitions, systems, inverse restrictions, and modeling.

37. Solve using distance reasoning or cases: $\|x-1\|+\|x+3\|=8$.	**38.** A classroom temperature must stay within $3°$F of $72°$F. Write and solve an absolute value inequality for the possible temperatures T.
39. Write the piecewise form of $f(x)=\|x-2\|+1$.	**40.** Write the piecewise form of $g(x)=-2\|x+3\|+5$.
41. Solve by graphing or algebra: $\|x-1\|=4$. State the intersection points of $y=\|x-1\|$ and $y=4$.	**42.** Solve the system: $y=\|x-2\|-3$ and $y=1$. State the ordered pairs.
43. Let $f(x)=\|x-2\|+3$ with restricted domain $x\geq 2$. Find $f^{-1}(x)$ and the domain of f^{-1}.	**44.** Let $f(x)=\|x-4\|$ and $g(x)=2x+1$. Find $f(g(3))$, $g(f(-2))$, and solve $f(x)=6$.

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Objective: I can apply absolute value equations and inequalities to distance, piecewise definitions, systems, inverse restrictions, and modeling.

45. Describe all transformations from $y = \|x\|$ to $y = -3\|x+2\|+7$. Then state the vertex, axis of symmetry, range, increasing interval, and decreasing interval.	**46.** Find the average rate of change of $f(x) = \|x-2\|-1$ on $[0, 5]$.
47. A measurement d must be within 2.5 units of 12. Write and solve an absolute value inequality.	**48.** A V-shaped pool depth is modeled by $D(x) = 0.5\|x-8\|+2$, where x is feet from the left edge. Find the shallowest depth and the depths at $x = 0$ and $x = 16$.
49. Find the minimum value of $F(x) = 2\|x+5\| - 9$. Where does it occur? State the range.	**50.** A delivery fee is modeled by $C(m) = 4\|m-10\|+15$. Find $C(6)$, $C(14)$, the minimum fee, where it occurs, and the range.

Objective: I can review supporting skills needed for absolute value functions, equations, and inequalities.

Other topics for review:

- Absolute value as distance from 0 on the number line.
- Vertex form: $y = a|x-h|+k$ with vertex (h, k) and axis of symmetry $x = h$.
- Intercepts, domain, range, end behavior, and intervals of increase/decrease.
- Solving absolute value equations by splitting into two cases and checking answers.
- Solving absolute value inequalities: “less than” gives an AND compound inequality; “greater than” gives an OR compound inequality.
- Checking for no solution, all real solutions, and extraneous solutions.