

Unit 5 Review

Absolute Value & Reciprocal Functions

ApexMath

Name: _____

Date: _____

Section 1 — Evaluating Absolute Values

Evaluate each expression. Show the step of simplifying inside the bars first.

1. $|-8|$

2. $|5 - 12|$

3. $3|-4|$

4. $|-3 + 7|$

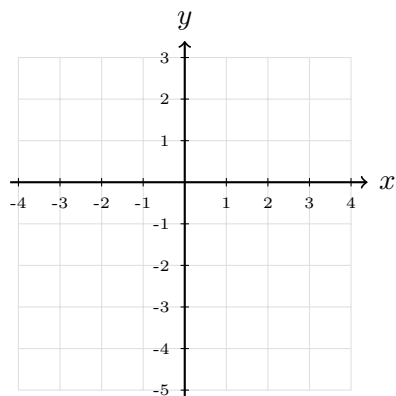
5. $-|10|$

Section 2 — Transformations of $y = |x|$

For each equation, state the vertex, opening direction, slope magnitude, domain, and range. Then sketch the graph on the provided axes.

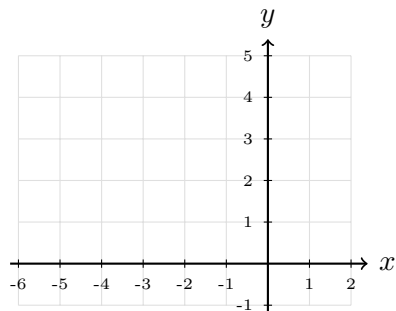
6. $y = |x| - 3$

Vertex: _____ Direction: _____ Slope mag.: _____ Domain: _____
 Range: _____



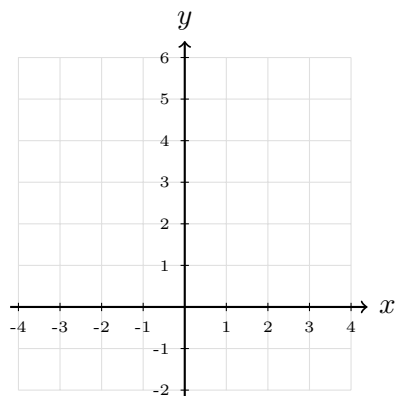
7. $y = |x + 2|$

Vertex: _____ Direction: _____ Slope mag.: _____ Domain: _____
 Range: _____



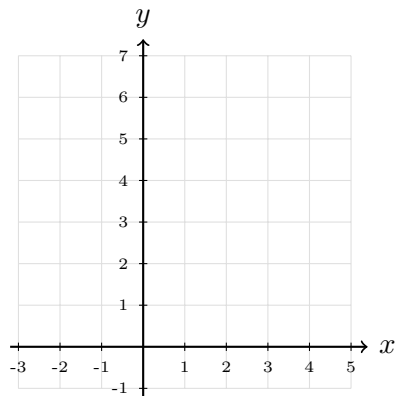
8. $y = -|x| + 4$

Vertex: _____ Direction: _____ Slope mag.: _____ Domain: _____
 Range: _____



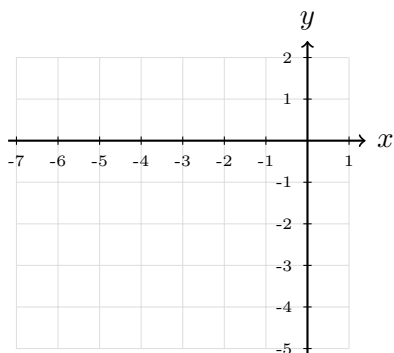
9. $y = 2|x - 1|$

Vertex: _____ Direction: _____ Slope mag.: _____ Domain: _____
 Range: _____



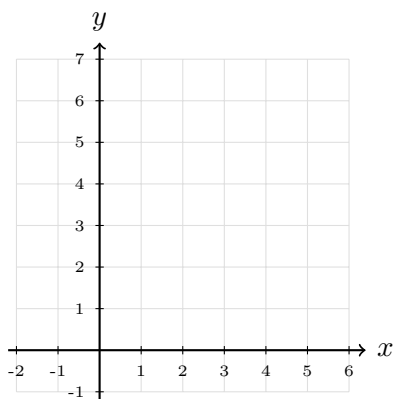
10. $y = -|x + 3| - 1$

Vertex: _____ Direction: _____ Slope mag.: _____ Domain: _____
 Range: _____



11. $y = 3|x - 2| + 1$

Vertex: _____ Direction: _____ Slope mag.: _____ Domain: _____
 Range: _____



Section 3 — Solving Absolute Value Equations

Solve each equation. Show the split step. Check both answers.

12. $|x - 4| = 6$

13. $|3x + 2| = 11$

14. $|x + 1| = -3$

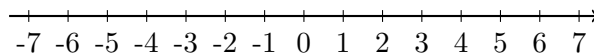
15. $|2x - 5| = 1$

Section 4 — Solving Absolute Value Inequalities

Solve each inequality. Write the solution in inequality notation and graph it on the number line.

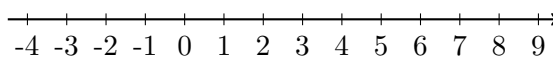
16. $|x| < 5$

Solution: _____



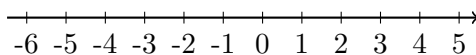
17. $|x - 3| \geq 4$

Solution: _____



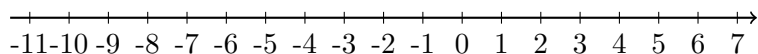
18. $|2x + 1| \leq 7$

Solution: _____



19. $|x + 2| > 6$

Solution: _____

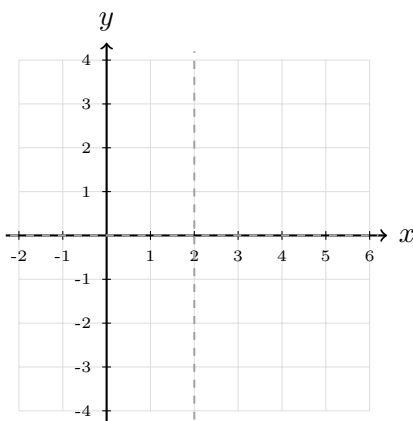


Section 5 — Reciprocal Functions

For each equation, state the VA, HA, domain, and range. Sketch the graph.

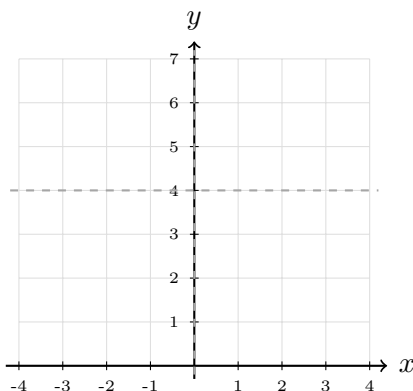
20. $y = \frac{1}{x - 2}$

VA: _____ HA: _____ Domain: _____ Range: _____



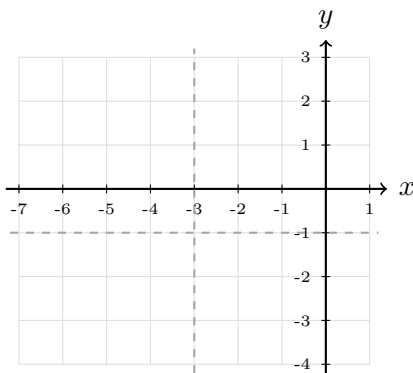
21. $y = \frac{1}{x} + 4$

VA: _____ HA: _____ Domain: _____ Range: _____



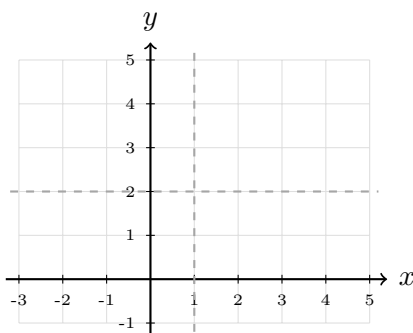
22. $y = \frac{1}{x+3} - 1$

VA: _____ HA: _____ Domain: _____ Range: _____



23. $y = \frac{1}{x-1} + 2$

VA: _____ HA: _____ Domain: _____ Range: _____



Write the equation of each reciprocal function from the given information.

24. VA at $x = 4$, HA at $y = -2$.

25. VA at $x = -1$, HA at $y = 3$.

Answer Key

Section 1

1.

$$|-8| = 8$$

$$\boxed{8}$$

2. Simplify inside first.

$$|5 - 12| = |-7| = 7$$

$$\boxed{7}$$

3. Evaluate the absolute value, then multiply.

$$3|-4| = 3(4) = 12$$

$$\boxed{12}$$

4. Simplify inside first.

$$|-3 + 7| = |4| = 4$$

$$\boxed{4}$$

5. The negative is *outside* the bars — apply it after.

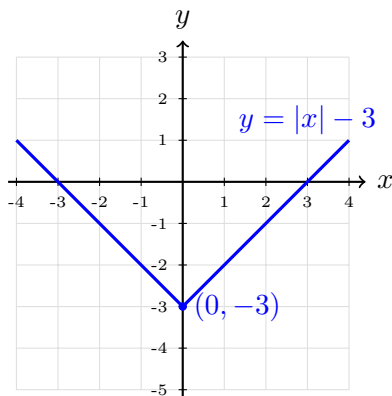
$$-|10| = -(10) = -10$$

$$\boxed{-10}$$

Section 2

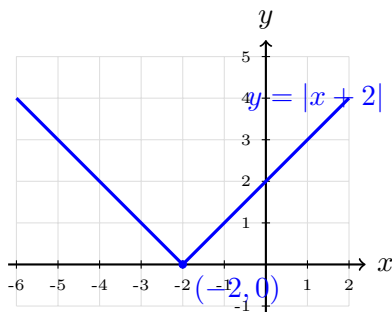
6. $y = |x| - 3$ $a = 1$, $h = 0$, $k = -3$.

Vertex $(0, -3)$, opens **up**, slope mag. 1. Domain $(-\infty, \infty)$, Range $[-3, \infty)$.



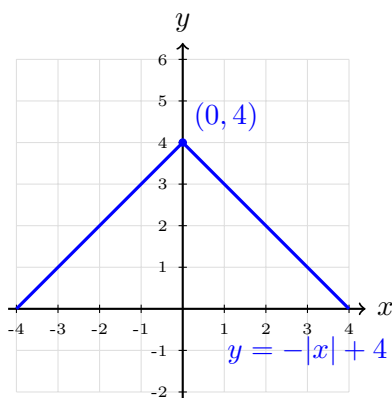
7. $y = |x + 2|$ $a = 1$, $h = -2$, $k = 0$.

Vertex $(-2, 0)$, opens **up**, slope mag. 1. Domain $(-\infty, \infty)$, Range $[0, \infty)$.



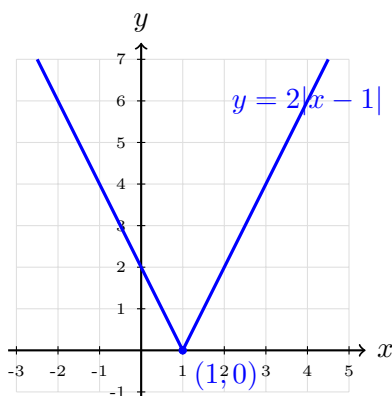
8. $y = -|x| + 4$ $a = -1$, $h = 0$, $k = 4$.

Vertex $(0, 4)$, opens **down**, slope mag. 1. Domain $(-\infty, \infty)$, Range $(-\infty, 4]$.



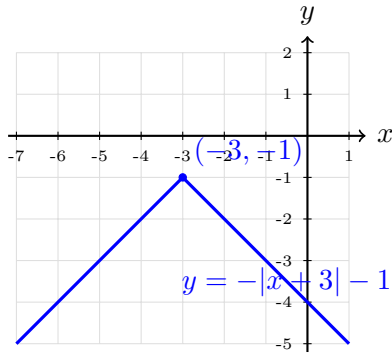
9. $y = 2|x - 1|$ $a = 2$, $h = 1$, $k = 0$.

Vertex $(1, 0)$, opens **up**, slope mag. 2. Domain $(-\infty, \infty)$, Range $[0, \infty)$.



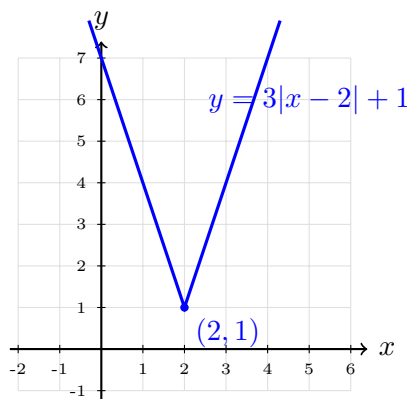
10. $y = -|x + 3| - 1$ $a = -1$, $h = -3$, $k = -1$.

Vertex $(-3, -1)$, opens **down**, slope mag. 1. Domain $(-\infty, \infty)$, Range $(-\infty, -1]$.



11. $y = 3|x - 2| + 1$ $a = 3$, $h = 2$, $k = 1$.

Vertex $(2, 1)$, opens **up**, slope mag. 3. Domain $(-\infty, \infty)$, Range $[1, \infty)$.



Section 3

12. $|x - 4| = 6$

Right-hand side $= 6 > 0$. Split:

$$x - 4 = 6 \implies x = 10 \quad \text{or} \quad x - 4 = -6 \implies x = -2$$

Check: $|10 - 4| = 6 \checkmark$ $|-2 - 4| = |-6| = 6 \checkmark$.

$x = 10 \quad \text{or} \quad x = -2$

13. $|3x + 2| = 11$

Split:

$$3x + 2 = 11 \implies 3x = 9 \implies x = 3$$

$$3x + 2 = -11 \implies 3x = -13 \implies x = -\frac{13}{3}$$

Check: $|3(3) + 2| = |11| = 11 \checkmark$ $|3(-\frac{13}{3}) + 2| = |-11| = 11 \checkmark$.

$x = 3 \quad \text{or} \quad x = -\frac{13}{3}$

14. $|x + 1| = -3$

Right-hand side = $-3 < 0$. Absolute value is never negative.

No solution

15. $|2x - 5| = 1$

Split:

$$2x - 5 = 1 \implies 2x = 6 \implies x = 3$$

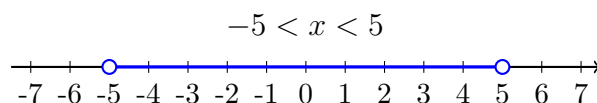
$$2x - 5 = -1 \implies 2x = 4 \implies x = 2$$

Check: $|2(3) - 5| = |1| = 1 \checkmark$ $|2(2) - 5| = |-1| = 1 \checkmark$.

$$x = 3 \quad \text{or} \quad x = 2$$

Section 4

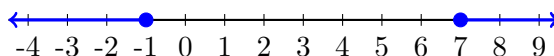
16. $|x| < 5$ Type: less-than (AND, between).



$$-5 < x < 5$$

17. $|x - 3| \geq 4$ Type: greater-than-or-equal (OR, outside, closed).

$$x - 3 \leq -4 \implies x \leq -1 \quad \text{or} \quad x - 3 \geq 4 \implies x \geq 7$$



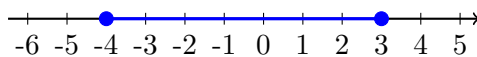
$$x \leq -1 \quad \text{or} \quad x \geq 7$$

18. $|2x + 1| \leq 7$ Type: less-than-or-equal (AND, between, closed).

$$-7 \leq 2x + 1 \leq 7$$

Subtract 1 from all parts: $-8 \leq 2x \leq 6$. Divide by 2:

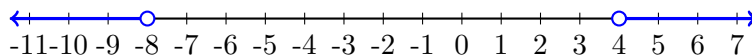
$$-4 \leq x \leq 3$$



$$-4 \leq x \leq 3$$

19. $|x + 2| > 6$ Type: greater-than (OR, outside, open).

$$x + 2 < -6 \implies x < -8 \quad \text{or} \quad x + 2 > 6 \implies x > 4$$



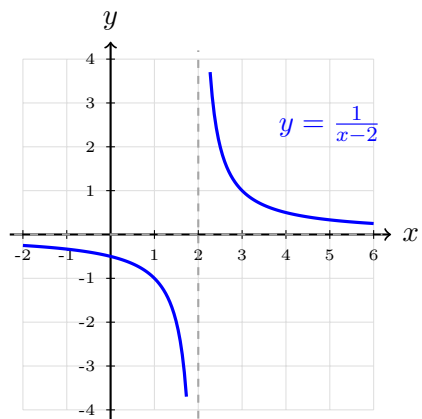
$$x < -8 \quad \text{or} \quad x > 4$$

Section 5

20. $y = \frac{1}{x-2}$ VA: $x = 2$, HA: $y = 0$.

Domain: $(-\infty, 2) \cup (2, \infty)$. Range: $(-\infty, 0) \cup (0, \infty)$.

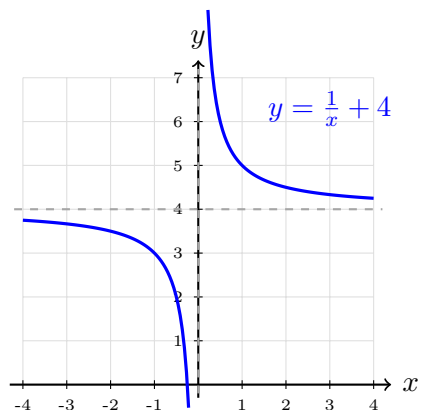
Key points: $x = 3 \Rightarrow y = 1$; $x = 1 \Rightarrow y = -1$.



21. $y = \frac{1}{x} + 4$ VA: $x = 0$, HA: $y = 4$.

Domain: $(-\infty, 0) \cup (0, \infty)$. Range: $(-\infty, 4) \cup (4, \infty)$.

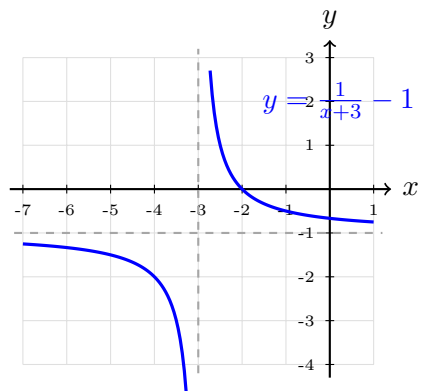
Key points: $x = 1 \Rightarrow y = 5$; $x = -1 \Rightarrow y = 3$.



22. $y = \frac{1}{x+3} - 1$ VA: $x = -3$, HA: $y = -1$.

Domain: $(-\infty, -3) \cup (-3, \infty)$. Range: $(-\infty, -1) \cup (-1, \infty)$.

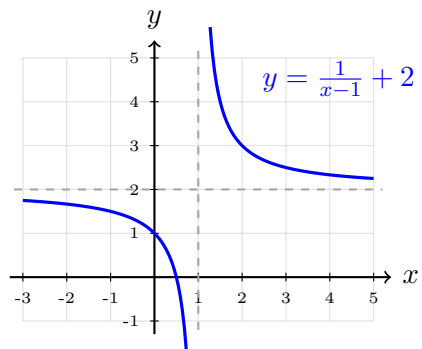
Key points: $x = -2 \Rightarrow y = 0$; $x = -4 \Rightarrow y = -2$.



23. $y = \frac{1}{x-1} + 2$ VA: $x = 1$, HA: $y = 2$.

Domain: $(-\infty, 1) \cup (1, \infty)$. Range: $(-\infty, 2) \cup (2, \infty)$.

Key points: $x = 2 \Rightarrow y = 3$; $x = 0 \Rightarrow y = 1$.



24. VA at $x = 4$, HA at $y = -2$. So $h = 4$, $k = -2$.

$$y = \frac{1}{x-4} + (-2) = \frac{1}{x-4} - 2$$

Verify: $x = 5 \Rightarrow y = 1 - 2 = -1 \checkmark$.

$$y = \frac{1}{x-4} - 2$$

25. VA at $x = -1$, HA at $y = 3$. So $h = -1$, $k = 3$.

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

Verify: $x = 0 \Rightarrow y = 1 + 3 = 4 \checkmark$.

$$y = \frac{1}{x+1} + 3$$

Thank you for learning with ApexMath!

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End of Unit 5 Review · ApexMath
