

Name: Answer key

Per: _____

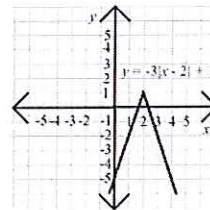
Date: _____

Serafino • Algebra 2E

2C:1

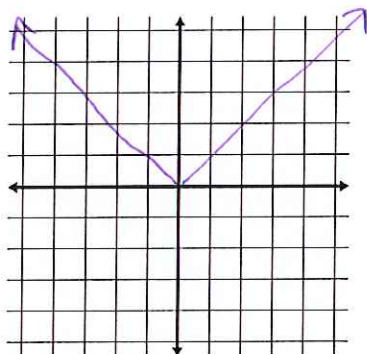
Absolute Value Graphs & Transformations

Classwork / HW

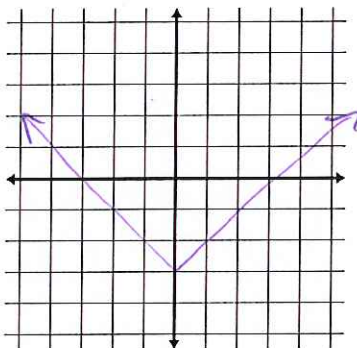


Graph the following absolute value functions:

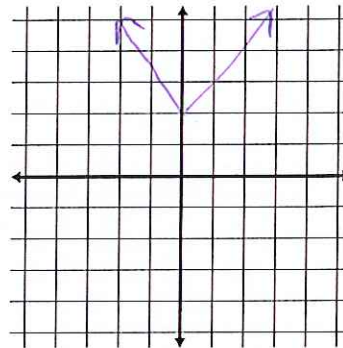
1. $f(x) = |x|$



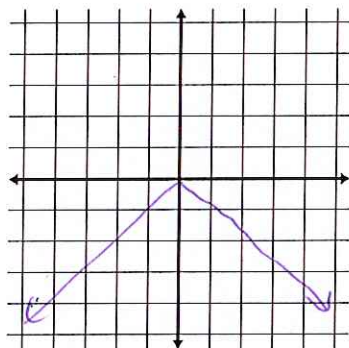
2. $f(x) = |x| - 3$



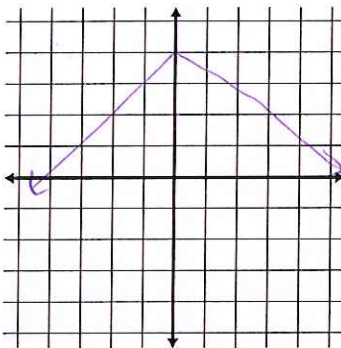
3. $f(x) = |x| + 2$



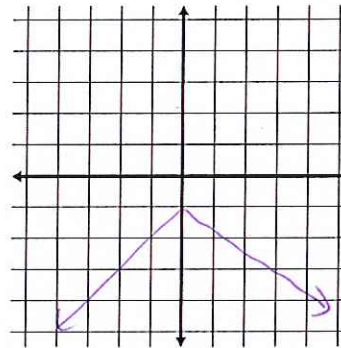
4. $f(x) = -|x|$



5. $f(x) = -|x| + 4$



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



Make an observation about what happens to the graph when you have a positive sign in front of the function. What about a negative

When the function is positive \rightarrow opens up

When the function is negative \rightarrow opens down

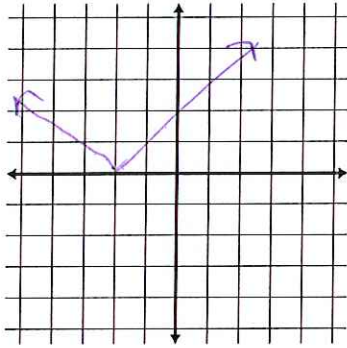
Make an observation about what happens to the graph when you add a number outside the grouping symbols. What about when you subtract?

When you add a number to the outside \rightarrow shifts up

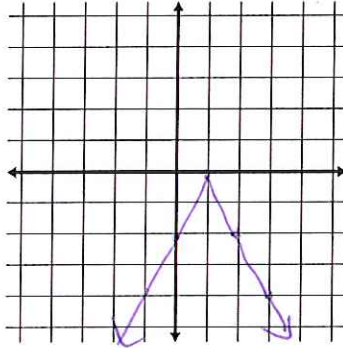
When you subtract a number from the outside \rightarrow shifts down

Graph the following absolute value equations.

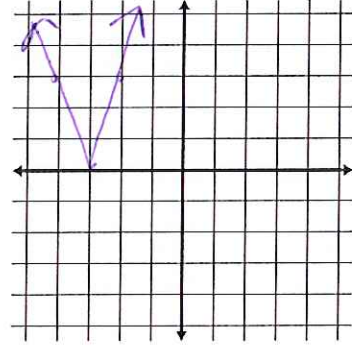
7. $f(x) = |x + 2|$



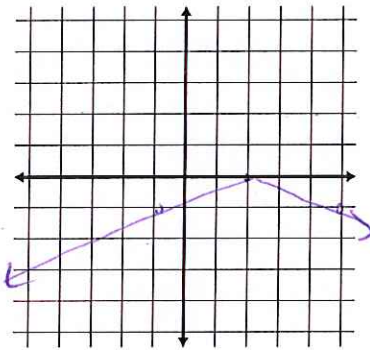
8. $f(x) = -2|x - 1|$



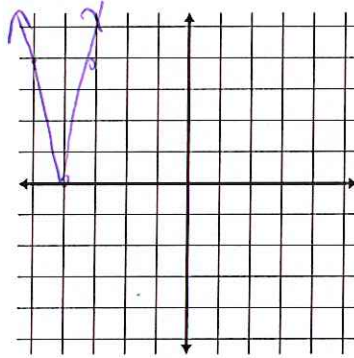
9. $f(x) = 3|x + 3|$



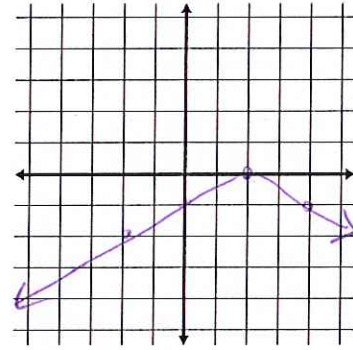
10. $f(x) = -1/3|x - 2|$



11. $f(x) = 4|x + 4|$



12. $f(x) = -1/2|x - 2|$



Make an observation about what happens to the graph when you add a number inside the absolute value signs. What about when you subtract?

When you add a number to x (inside) \rightarrow shift LEFT

When you subtract a number from x (inside) \rightarrow shift RIGHT

} opposite of how it looks

Make an observation about what happens to the graph when the number before the absolute value sign gets larger? What if it gets smaller?

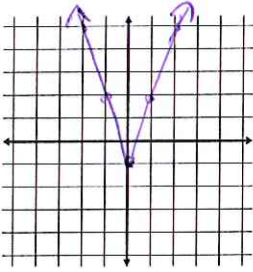
As the number approaches zero \rightarrow gets wider \rightarrow vertical compression

As the number gets further from zero \rightarrow gets narrower \rightarrow vertical stretch

* it compresses / stretches away from the x-axis

Let's put it all together! Graph the following. State the domain and range of each.

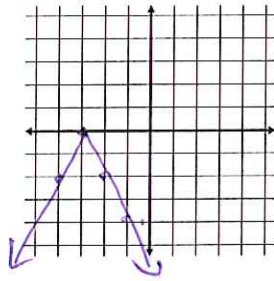
13. $f(x) = 3|x| - 1$



$$D: x \in \mathbb{R}$$

$$R: y \geq -1$$

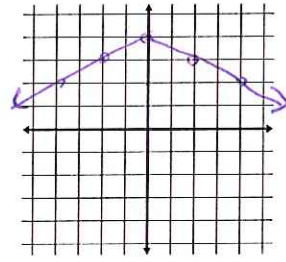
14. $f(x) = -2|x+3|$



$$D: x \in \mathbb{R}$$

$$R: y \leq 0$$

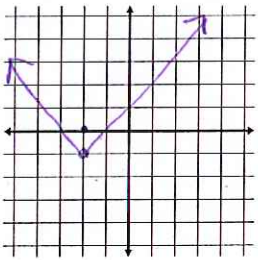
15. $f(x) = -1/2|x| + 4$



$$D: x \in \mathbb{R}$$

$$R: y \leq 4$$

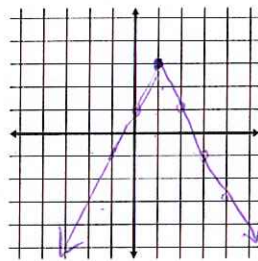
16. $f(x) = |x+2| - 1$



$$x \in \mathbb{R}$$

$$y \geq -1$$

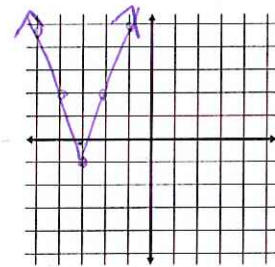
17. $f(x) = -2|x-1| + 3$



$$x \in \mathbb{R}$$

$$y \leq 3$$

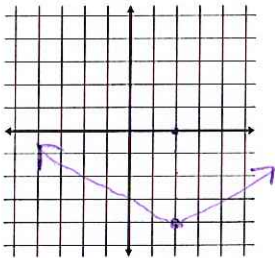
18. $f(x) = 3|x+3| - 1$



$$x \in \mathbb{R}$$

$$y \geq -1$$

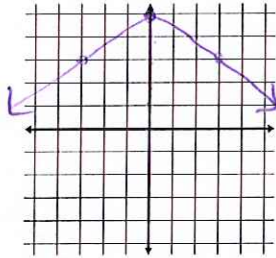
19. $f(x) = 1/2|x-2| - 4$



$$x \in \mathbb{R}$$

$$y \geq -4$$

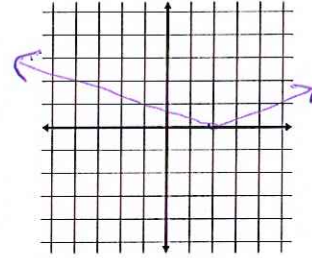
20. $f(x) = -2/3|x| + 5$



$$x \in \mathbb{R}$$

$$y \leq 5$$

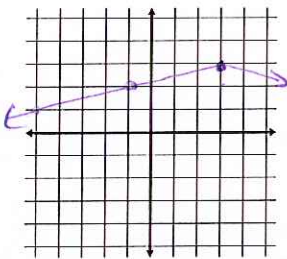
21. $f(x) = 1/3|x-2|$



$$x \in \mathbb{R}$$

$$y \geq 0$$

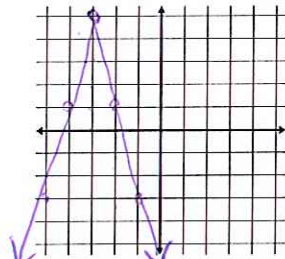
22. $f(x) = -1/4|x-3| + 3$



$$x \in \mathbb{R}$$

$$y \leq 3$$

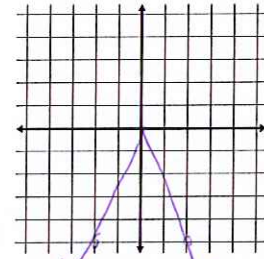
23. $f(x) = -4|x+3| + 5$



$$x \in \mathbb{R}$$

$$y \leq 5$$

24. $f(x) = -5/2|x|$

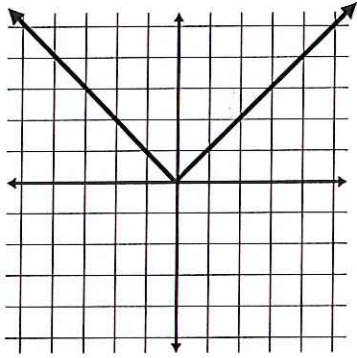


$$x \in \mathbb{R}$$

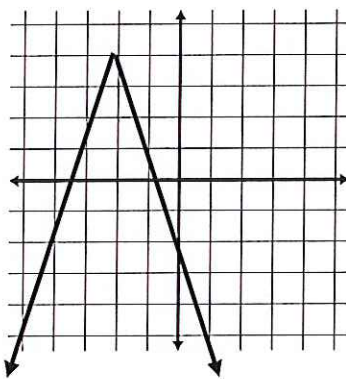
$$y \leq 0$$

Write the functions of the following graphs. (Hint: first, write the vertex & slope)

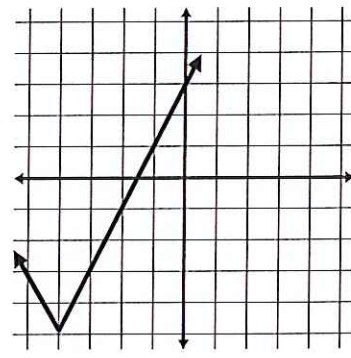
25. $y = |x|$



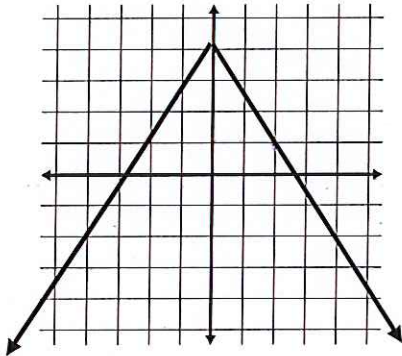
26. $y = -3|x+2|+4$



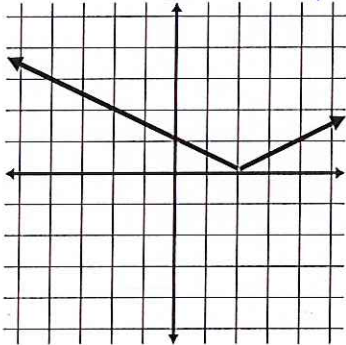
27. $y = 2|x+4|-5$



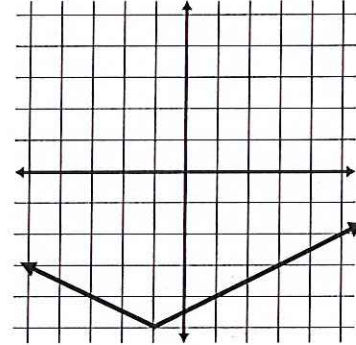
28. $y = -\frac{3}{2}|x|+4$



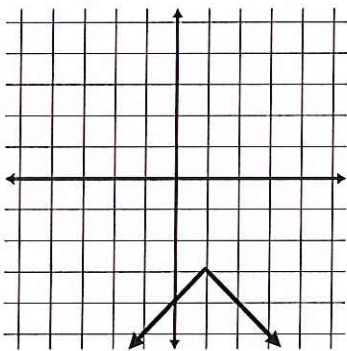
29. $y = \frac{1}{2}|x-2|$



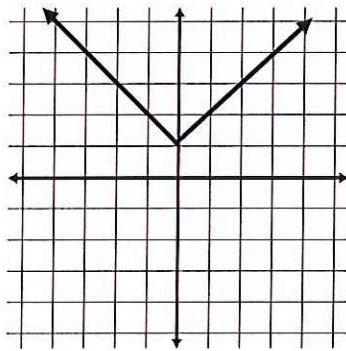
30. $y = \frac{1}{2}|x+1|-5$



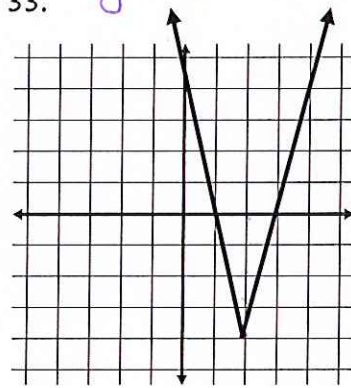
31. $y = -|x-1|-3$



32. $y = |x|+1$



33. $y = 4|x-2|-4$



34. Write the equation of an absolute value graph that has:

- a) a vertex at $(-1, 3)$ and contains the point $(-3, 7)$

$$m = \frac{4}{-2} = 2$$

$$y = 2|x+1|+3$$

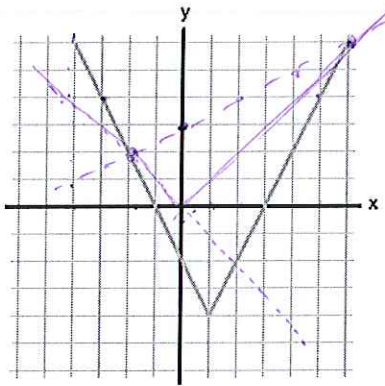
- b) a vertex at $(1, -2)$ and contains the point $(-5, -8)$

$$m = \frac{-6}{-6} = 1$$

$$y = -|x+1|-2$$

Analyzing the Graphs of an Absolute Value Function

35.



a. What is the equation of this function?

$$f(x) = 2|x - 1| - 4$$

b. Domain?

$$x \in \mathbb{R}$$

Range?

$$y \geq -4$$

c. Maximum or Minimum value?

at -4

d. What is/are the x-intercept(s)?

$$(-1, 0) \quad (3, 0)$$

e. What is the y-intercept? $(0, -2)$

f. $f(-2) = 2$

g. $f(2) = -2$

h. $f(0) = -2$

i. $f(5.2356) =$

$$2|5.2356 - 1| - 4 = 4.4712$$

j. $f(52) =$

$$2|52 - 1| - 4 = 98$$

k. $f(-100) =$

$$2|-100 - 1| - 4 = 198$$

l. $f(x) = 4$

$$x \in \{-3, 5\}$$

m. $f(x) = -4$

$$x \in \{1\}$$

n. $f(x) = -6$

$$x \in \emptyset$$

Give answers in set or inequality notation, and graph on a number line:

o. Where does $f(x)$ intersect $y = 6$?

$$x \in \{-4, 6\}$$

p. Where does $f(x)$ intersect $y = -x$?

$$x \in \{-2, 2\}$$

q. Where does $f(x)$ intersect $y = 1/2x + 3$?

$$x \in \{-2, 6\}$$

r. Where is $f(x) < 0$?

$$x \in (1, 3)$$

s. Where is $f(x) > |x|$?

$$x < -2 \text{ or } x > 6$$

Transforming Absolute Value Functions

Hint: Write out the transformations being performed, in order...

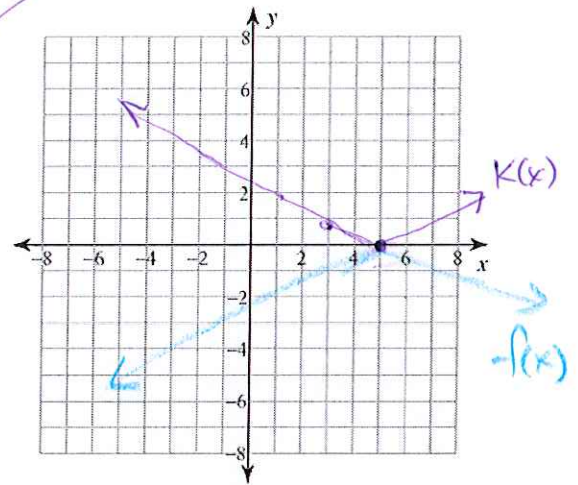
36. If $f(x) = -\frac{1}{2}|x - 5|$, write the equation of and sketch $k(x) = -f(x)$

$$k(x) = -f(x)$$

$$= -\left(-\frac{1}{2}|x - 5|\right)$$

$$k(x) = \frac{1}{2}|x - 5|$$

① Reflect over x-axis

37. If $f(x) = |x + 3|$, write the equation of and sketch $g(x) = 2f(x) - 4$

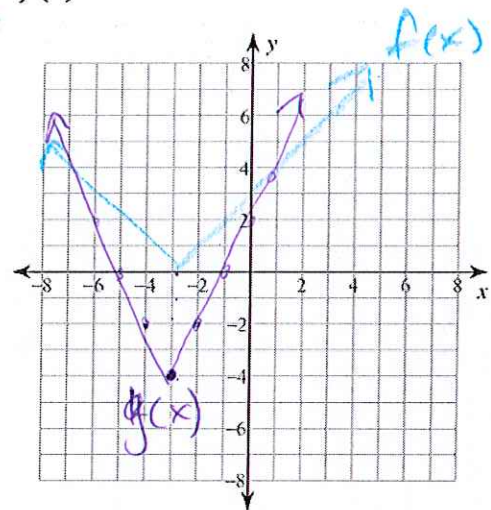
$$g(x) = 2f(x) - 4$$

$$= 2(|x + 3|) - 4$$

① multiply by 2
→ vertical stretch

② shift down

$$g(x) = 2|x + 3| - 4$$

38. If $f(x) = 4|x - 5| + 2$, write the equation of and sketch $h(x) = -\frac{1}{2}f(x + 1)$

$$h(x) = -\frac{1}{2}f(x + 1)$$

$$= -\frac{1}{2}\left[4|x - 5| + 2\right]$$

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

$$= -2|x - 4| - 1$$

① Reflect over x-axis

② vertical compression

③ shift left

$$h(x) = -2|x - 4| - 1$$

