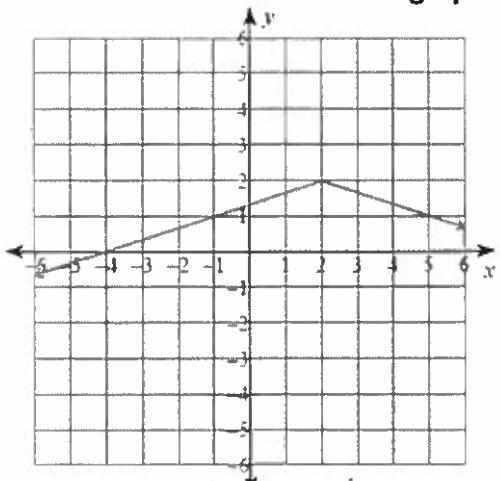
Absolute Value Test Review

Name: Answer Key

Determine the attributes of each graph.

1)



Equation: $y = -\frac{1}{3}|x-2|+2$

Vertex: (2,2) Opens: down

Slopes: $\frac{1}{3}$ and $-\frac{1}{3}$ Axis of Symmetry: $x=2$

Increasing: $(-\infty, 2)$ Decreasing: $(2, \infty)$

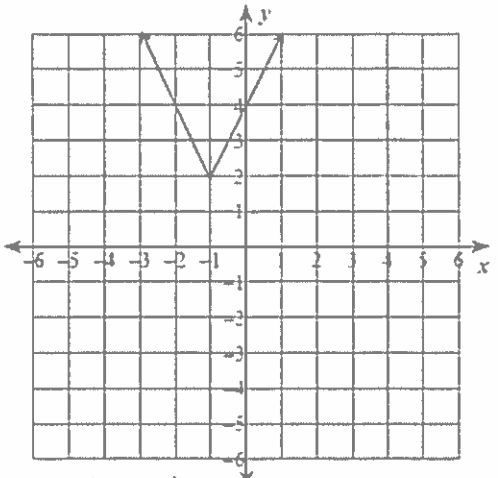
Domain: $(-\infty, \infty)$ Range: $(-\infty, 2]$

x-intercept(s): (-4,0) (8,0) y-intercept: $(0, 1.\overline{3})$

End behavior: As $x \to \infty$, $f(x) \to -\infty$
and As $x \to -\infty$, $f(x) \to -\infty$

Transformation(s): shift right 2 and up 2, vert. comp. by $\frac{1}{3}$, vert. reflection

2)



Equation: $y = 2|x+1|+2$

Vertex: (-1, 2) Opens: up

Slopes: 2 and -2 Axis of Symmetry: $x=-1$

Increasing: $(-1, \infty)$ Decreasing: $(-\infty, -1)$

Domain: $(-\infty, \infty)$ Range: $[2, \infty)$

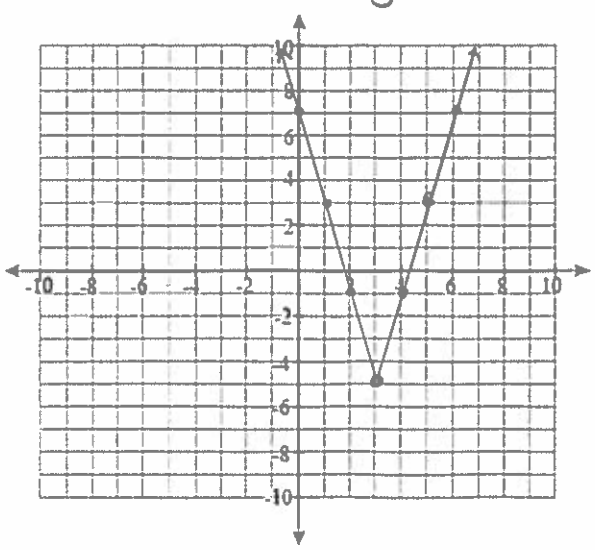
x-intercept(s): None y-intercept: (0,4)

End behavior: As $x \to \infty$, $f(x) \to \infty$
and As $x \to -\infty$, $f(x) \to \infty$

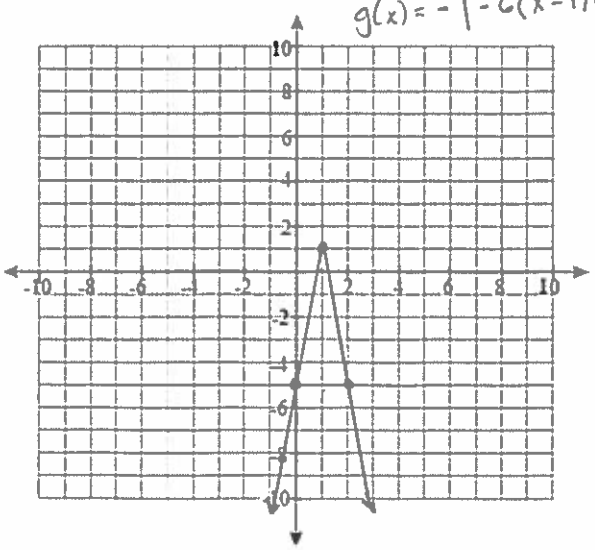
Transformation(s): shift up 2 and left 1, vert. stretch by 2

Graph the following absolute value equations by hand.

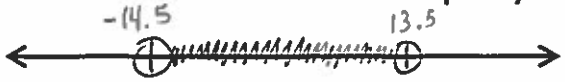
3) $y = 2|2x-6|-5 \rightarrow y = 2|2(x-3)|-5$



4) $g(x) = -|6-6x|+1 \rightarrow g(x) = -|-6x+6|+1$
$g(x) = -|-6(x-1)|+1$



Find the solution set for each inequality. Show the number line and interval notation.



5) $-\frac{1}{2}|2x+1|-6>-20$

$-\frac{1}{2}|2x+1|>-14$

$|2x+1|<28$

$-28<2x+1<28$

$-1 \quad -1 \quad -1$

$-\frac{29}{2}<\frac{2x}{2}<\frac{27}{2}$

$-14.5<x<13.5 \quad (-14.5, 13.5)$

6) $|x+4|+23 \geq 58$

$|x+4| \geq 35$

$x+4 \geq 35$ $\qquad$ $x+4 \leq -35$

$x \geq 31$ $\qquad$ $x \leq -39$

$(-\infty, -39) \cup (31, \infty)$

Solve each equation. Check for extraneous solutions.

7) $-3|x-1| = -18$

$|x-1| = 6$

$x-1=6 \qquad x-1=-6$

$x=7$ and $x=-5$

8) $|2x+5|-2 = 3x+1$

$|2x+5| = 3x+3$

$2x+5 = 3x+3$

$-2x \quad -2x$

$5 = x+3$

$-3 \quad -3$

$2 = x$

$2x+5 = -3x-3$

$+3x \quad +3x$

$5x+5 = -3$

$-5 \quad -5$

$5x = -8$

$x = -1.6$

Extraneous

9) $2|2x-5| = 10-6x$

$|2x-5| = 5-3x$

$2x-5 = 5-3x$

$+3x \quad +3x$

$5x-5 = 5$

$+5 \quad +5$

$5x = 10$

$x = 2$ Extraneous

$2x-5 = -5+3x$

$-2x \quad -2x$

$-5 = -5+x$

$+5 \quad +5$

$0 = x$

10) $|3-3x|-4 = -1$

$|3-3x| = 3$

$3-3x = 3$

$-3x = 0$

$x = 0$ and $x = 2$

$3-3x = -3$

$-3x = -6$

Write the following absolute value equation as a piecewise equation.

11) f(x) = 3|2x + 4| − 6

opens up

$f(x) = 3|2(x+2)| - 6$ vertex: $(-2, -6)$ slopes: 6 and −6

$y - y_1 = m(x - x_1)$

$y + 6 = 6(x+2)$

$y + 6 = 6x + 12$

$y = 6x + 6$

$y + 6 = -6(x+2)$

$y + 6 = -6x - 12$

$y = -6x - 18$

$$f(x) = \begin{cases} -6x - 18, & x \le -2 \\ 6x + 6, & x \ge -2 \end{cases}$$

12) A man is sitting in a boat on a lake (presumably looking for a pearl). He can get a sunburn from sunlight that hits him directly and from a sun beam that reflects off the water. A sun beam reflects off the water at the point (3,0) and hits the man at the point(6,2).

a. Write an equation for the path of the sun beam.

vertex: $(3,0)$ (x_1, y_1) point: $(6,2)$ (x_2, y_2)

$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{2-0}{6-3} = \frac{2}{3}$

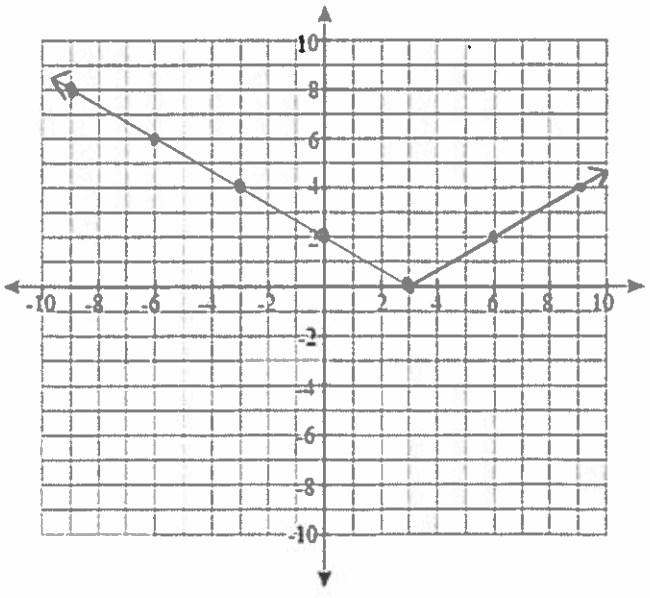
opens up

$y = a|x - h| + k$

$y = \frac{2}{3}|x - 3| + 0$

$$y = \frac{2}{3}|x - 3|$$

b. Graph the function for the path of the sun beam.



c. Is it possible for the sun beam to hit a bird flying overhead at the point (20,12)? Why or why not?

$y = \frac{2}{3}|20 - 3|$

$y = \frac{2}{3}|17|$

$y = 11.\overline{3}$ ← Not 12

The sun beam does not hit the bird

Evaluate each absolute value.

Given: $f(x) = 2|4 - 5x| + 1$ $g(x) = -|2x + 3| + 4$ $h(x) = \frac{1}{4}|x + 3|$

13) f(2)

$f(2) = 2|4 - 5(2)| + 1$

$f(2) = 2|4 - 10| + 1$

$f(2) = 2|-6| + 1$

$f(2) = 2(6) + 1$

$\boxed{f(2) = 13}$

14) h(-1)

$h(-1) = \frac{1}{4}|-1 + 3|$

$h(-1) = \frac{1}{4}|2|$

$h(-1) = \frac{1}{4}(2)$

$\boxed{h(-1) = \frac{1}{2}}$

15) g(-3)

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

$g(-3) = -|-6 + 3| + 4$

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

$g(-3) = -(3) + 4$

$g(-3) = -3 + 4$

$\boxed{g(-3) = 1}$

16) g(x – 6)

$g(x-6) = -|2(x-6) + 3| + 4$

$g(x-6) = -|2x - 12 + 3| + 4$

$\boxed{g(x-6) = -|2x - 9| + 4}$