Honors Algebra 2
WS H4-8

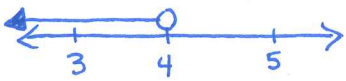
Name KEY
Date_____ Per_____

Solving Inequalities & Systems of Inequalities

Solve the following inequalities algebraically and draw a number line graph to represent each solution.

1) $8-3x<4(3-x)$

$8-3x<12-4x$
$-8+4x \quad -8+4x$
$x<4$



2) $2(x+4)-5\geq 5(x+3)$

$2x+8-5\geq 5x+15$
$2x+3\geq 5x+15$
$-2x-15 \quad -2x-15$
$\frac{-12}{3}\geq\frac{3x}{3}$
$-4\geq x$ (SAME AS $x\leq -4$)

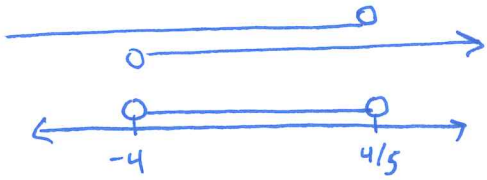
3) $|5x-16|\geq 4$

$5x-16\geq 4$ OR $5x-16\leq -4$
$\frac{5x}{5}\geq\frac{20}{5}$ $\quad$ $\frac{5x}{5}\leq\frac{12}{5}$
$x\geq 4$ OR $x\leq 2.4$

4) $2|5x+8|-3<21$

$+3 \quad +3$
$\frac{2|5x+8|}{2}<\frac{24}{2}$
$|5x+8|<12$

$5x+8<12$ and $5x+8>-12$
$-8 \quad -8$ $\quad$ $-8 \quad -8$
$\frac{5x}{5}<\frac{4}{5}$ $\quad$ $\frac{5x}{5}>\frac{-20}{5}$
$x<\frac{4}{5}$ and $x>-4$



5) $2x^2-2x-15\leq x^2-5x+13$

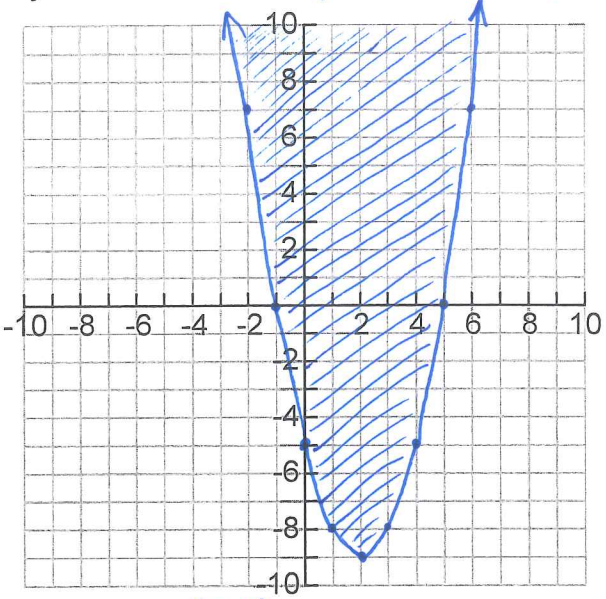
$x^2+3x-28\leq 0$
$x^2+3x-28=0$ $\quad$ $\boxed{-7\leq x\leq 4}$
$(x+7)(x-4)=0$
$x+7=0 \quad x-4=0$
$x=-7 \quad x=4$
BOUNDARY POINTS

6) $4x^2+3x-5>3x^2+10x-15$

$x^2-7x+10>0$
$x^2-7x+10=0$
$(x-5)(x-2)=0$
$x-5=0 \quad x-2=0$
$x=5 \quad x=2$ ← BOUNDARY POINTS
$\boxed{x<2 \text{ or } x>5}$

Graph the following inequalities.

7) $y \geq x^2 - 4x - 5$ → $y \geq (x-2)^2 - 9$

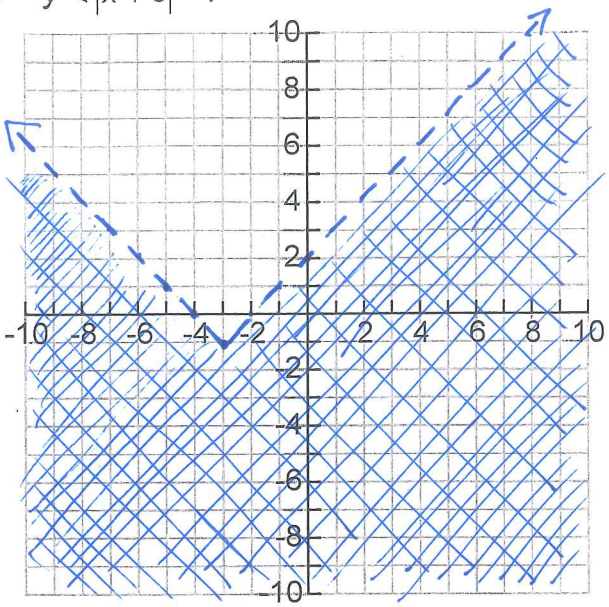


Check: (0,0)

$0 \geq (0)^2 - 4(0) - 5$

$0 \geq -5$ ✓

8) $y < |x+3| - 1$

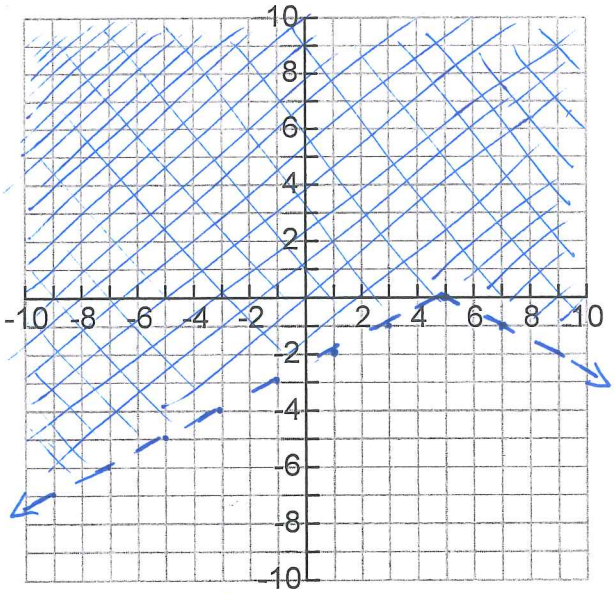


Check: (0,0)

$0 < |0+3| - 1$

$0 < 2$ ✓

9) $y > -\frac{1}{2}|x-5|$

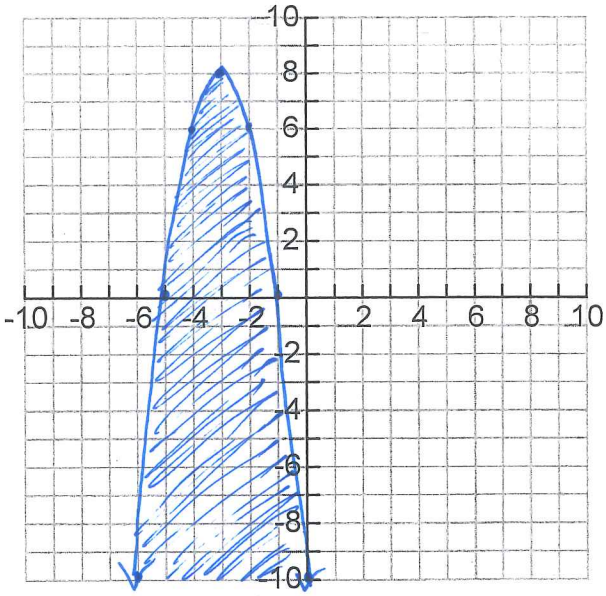


Check: (0,0)

$0 > -\frac{1}{2}|0-5|$

$0 > -2.5$ ✓

10) $y \leq -2(x+3)^2 + 8$



Check: (-2,-2)

$-2 \leq -2(-2+3)^2 + 8$

$-2 \leq 6$ ✓

Graph the following systems of inequalities

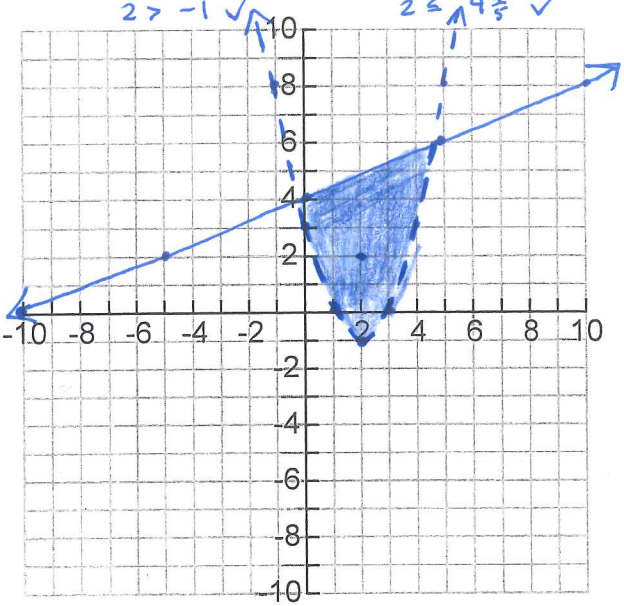
11) $y > x^2 - 4x + 3$ $\quad y > (x-2)^2 - 1$

$y \le \frac{2}{5}x + 4$

Check (2,2)

$2 > (2)^2 - 4(2) + 3$ $\quad 2 \le \frac{2}{5}(2) + 4$

$2 > -1$ ✓ $\quad 2 \le 4\frac{4}{5}$ ✓



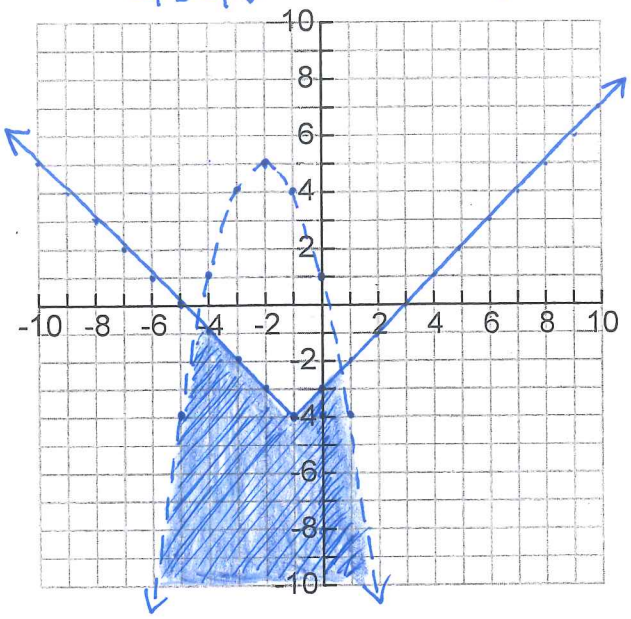
12) $y \le |x+1| - 4$

$y < -(x+2)^2 + 5$

Check (-4,-4)

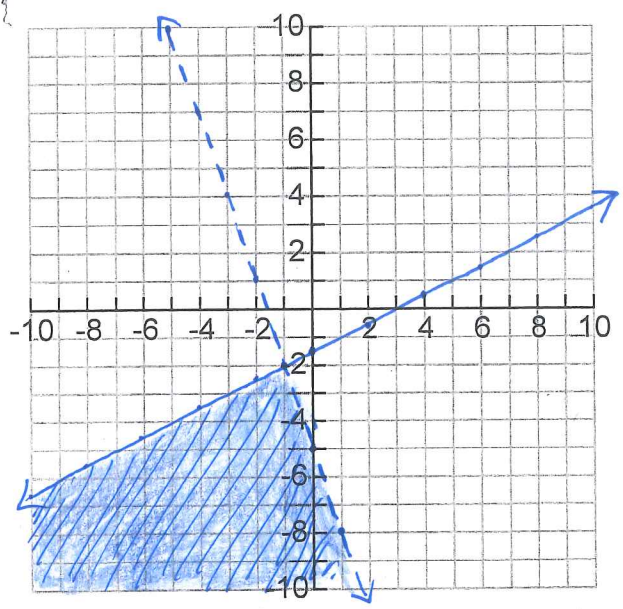
$-4 \le |-4+1| - 4$ $\quad -4 < -(-4+2)^2 + 5$

$-4 \le -1$ ✓ $\quad -4 < 1$ ✓



13) $3x + y < -5$ $\quad y < -3x - 5$

$2x - 4y \ge 6$ $\quad y \le \frac{1}{2}x - \frac{3}{2}$



Check: (-2,-4)

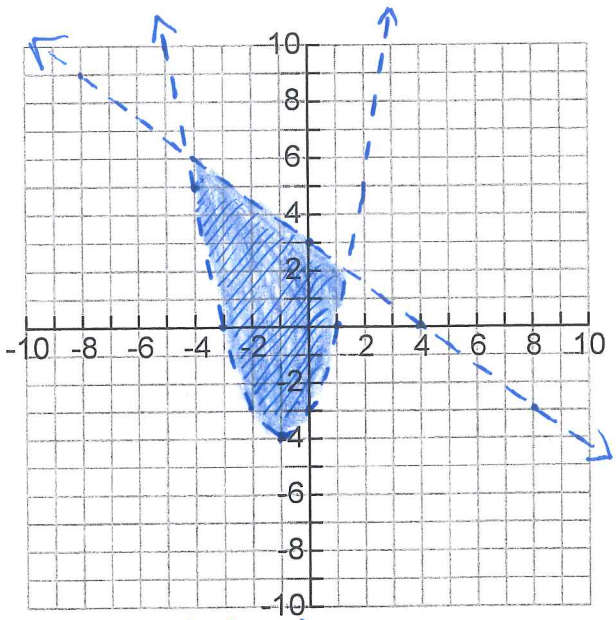
$3(-2) + (-4) < -5$ $\quad 2(-2) - 4(-4) \ge 6$

$-10 < -5$ ✓ $\quad -4 + 16 \ge 6$

$12 \ge 6$ ✓

14) $3x + 4y < 12$ $\quad y < -\frac{3}{4}x + 3$

$y > (x+1)^2 - 4$



Check (0,0)

$3(0) + 4(0) < 12$

$0 < 12$ ✓

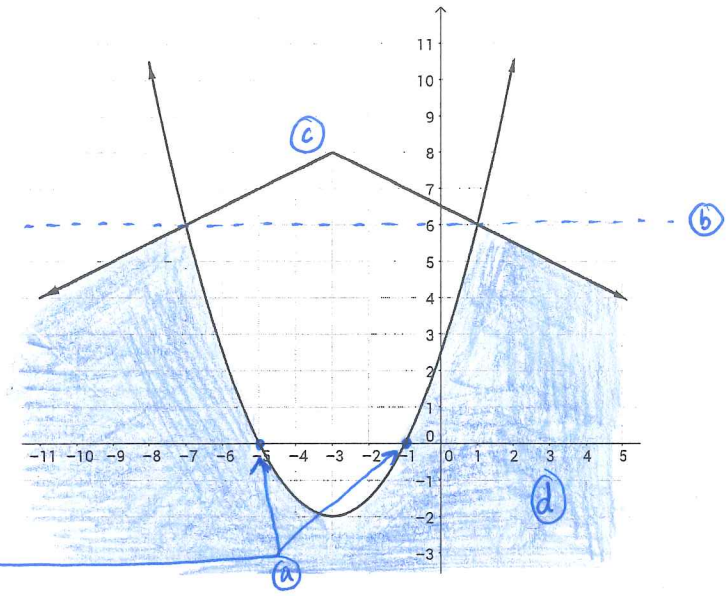
$0 > (0+1)^2 - 4$

$0 > -3$ ✓

15) At right are the graphs of two functions, f(x) & g(x):

$f(x) = 0.5\,(x+3)^2 - 2$

$g(x) = -0.5\,|x + 3| + 8$



Use the graphs to solve the following.

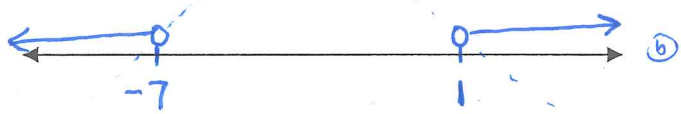
a) Solve for x: $0.5\,(x+3)^2 - 2 = 0$

$x = -5$ or $x = -1$

b) For what values of x is $-0.5\,|x + 3| + 8 < 6$. State your answer algebraically and graph it on a number line.

which points on the absolute value graph have outputs (y-values) that are less than "6"?

$\boxed{x < -7 \text{ OR } x > 1}$



c) For what values of x is $-0.5\,|x + 3| + 8 \geq 0.5\,(x+3)^2 - 2$? State your answer algebraically and graph it on a number line.

The absolute value graph is greater than the parabola when its output (y-values) are greater than the output values of the parabola for the same inputs.

i.e. parabola $(-5, 0)$ Abs value $(-5, 7)$ ← "7" > "0"

$\boxed{-7 \leq x \leq 1}$

d) On the graph above, lightly shade the region that represents the solution to this system of inequalities.

$f(x) \leq 0.5\,(x+3)^2 - 2$

$g(x) \leq -0.5\,|x + 3| + 8$

Check: $(0,0)$

$f(0) \leq 0.5(0+3)^2 - 2$

$0 \leq 0.5(0+3)^2 - 2$

$0 \leq 2.5$ ✓

$g(0) \leq -0.5|0+3| + 8$

$0 \leq -1.5 + 8$

$0 \leq 6.5$ ✓