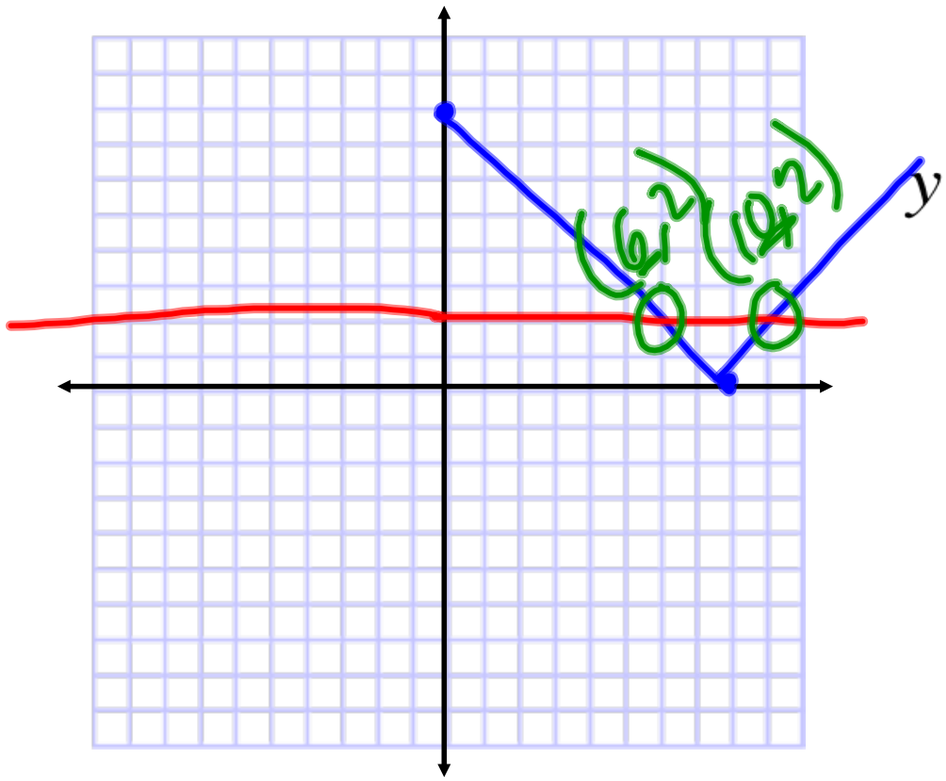
P.7 Absolute Value Inequalities

Solving by intersection

$|t-8|=y$

$|t-8|=2$



$y-$ int*ercept*

$|0-8|=y$

$8=y$

$x-$ int*ercept*

$|t-8|=0$

$6,10$

$|t-8|=2$

$t-8=2$

$+8\ \ +8$

$t=10$

$\frac{-(t-8)}{-1}=\frac{2}{-1}$

$t-8=-2$

$+8\ \ +8$

$t=6$

Algebraically

Absolute Value Inequalities

$\geq, >$ great"or" "or" inequality

$\leq, <$ less th"and" "and" inequality

examples: decide if it is "and" or "or" and write the inequalities

$|2x-5| \leq 15$ and

$2x-5 \leq 15$ $\quad -(2x-5) \leq 15$

$\quad -1 \quad -1$

$2x-5 \geq -15$

$-15 \leq 2x-5 \leq 15$

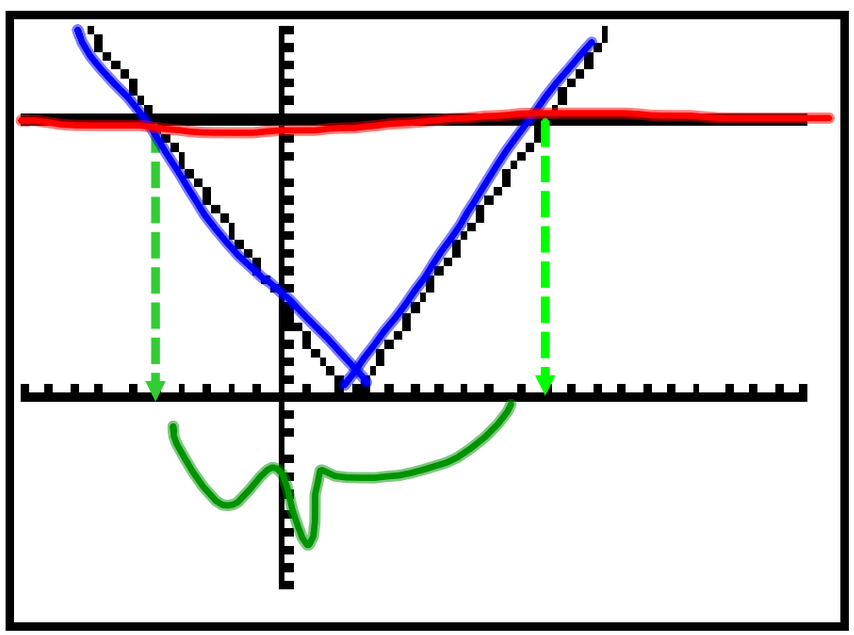
$|2-x| \geq 1$ OR

$2-x \geq 1$ $\quad -(2-x) \geq 1$

$\quad -1 \quad -1$

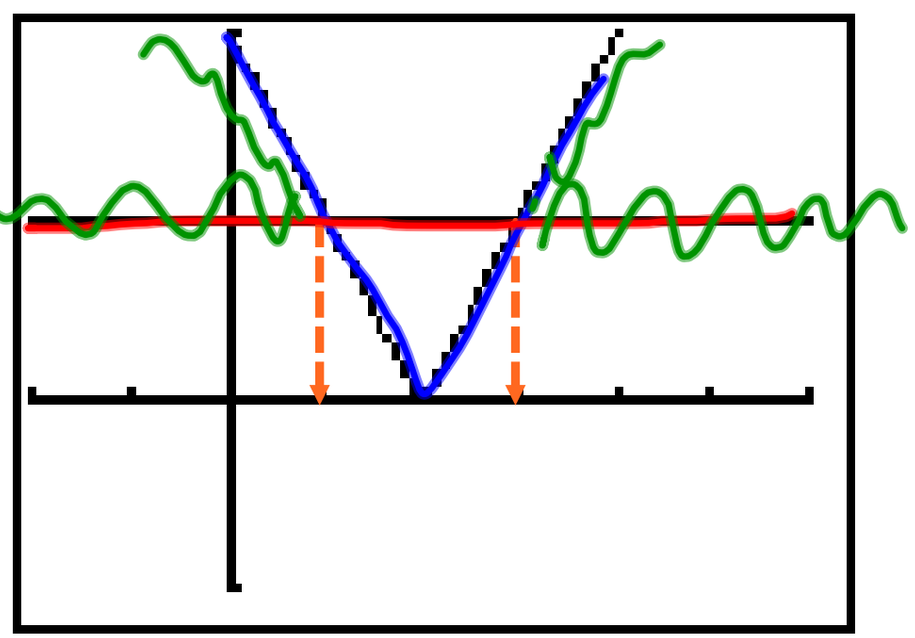
$2-x \leq -1$

$$|2x-5| \leq 15$$



Less th"and"
The points on y=2x-5 are less than the points of y=15 between the green lines

$$|2-x| > 1$$



Great"or"
The points on 2-x are greater than the points on y-1 towards infinity of the orange lines

To solve absolute value inequalities:

$|a+c|-d>e$
$+d \quad +d$

1. Isolate the absolute value on the left.
2. Decide if you have a "or" or "and" inequality
3. Write the inequalities.
4. Solve the inequalities.
5. Graph to find "and" intersection / "or union"
6. Check your answer in the original problem
7. Write the answer in interval notation.

2 different

1 double

Examples:

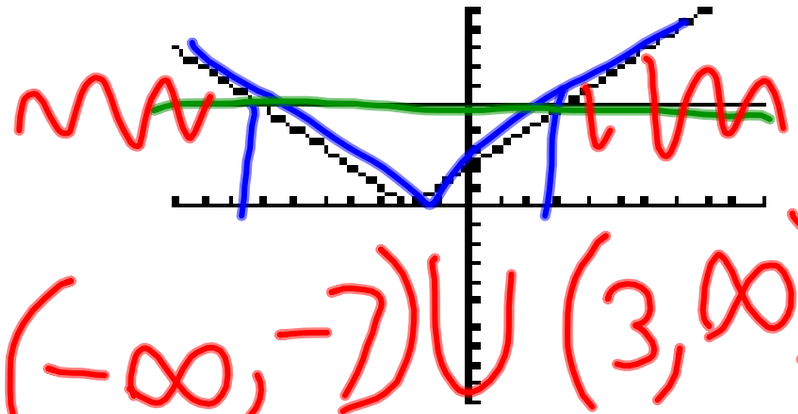
$|x+2| > 5$ OR

$x+2 > 5$ $\quad -2 \quad -2$

$x > 3$

$x+2 < -5$ $\quad -2 \quad -2$

$x < -7$



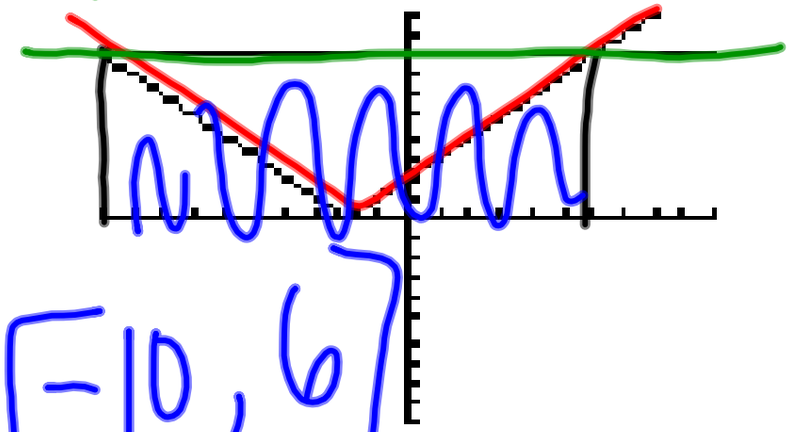
$(-\infty, -7) \cup (3, \infty)$

$|x+2| \leq 8$ and

$-8 \leq x+2 \leq 8$

$\quad -2 \quad -2 \quad -2$

$-10 \leq x \leq 6$

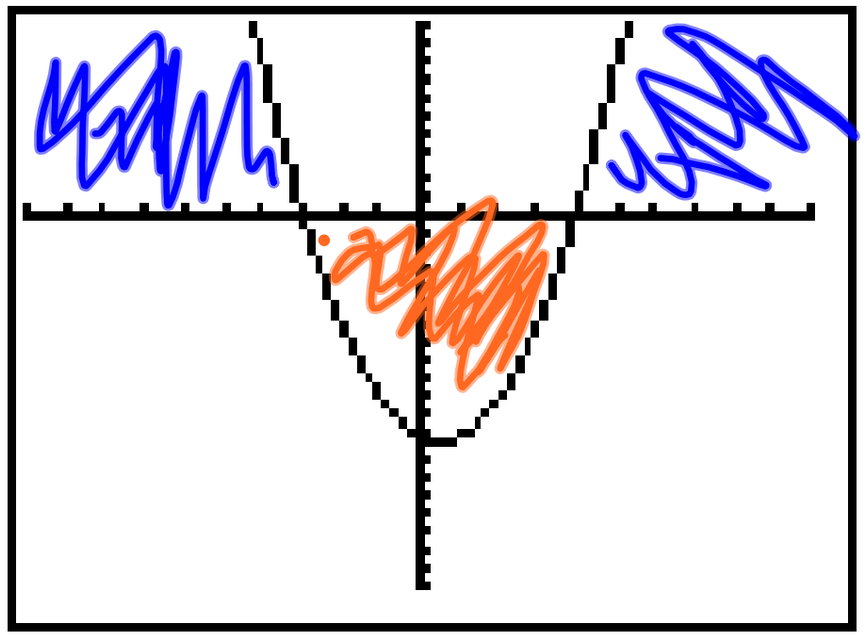


$[-10, 6]$

$$|2x-3|+7<28$$

Solving Quadratic Inequalities

1. Make right side of the inequality 0
2. Decide if you have an "or" or "and" inequality
3. Solve the quadratic equation
4. Graph the quadratic and decide which values are above or below x-axis
5. Write in interval notation



Great"or" = Above x-axis

Less th"and" = Below x-axis

Examples $x^2 - x - 12 \geq 0$

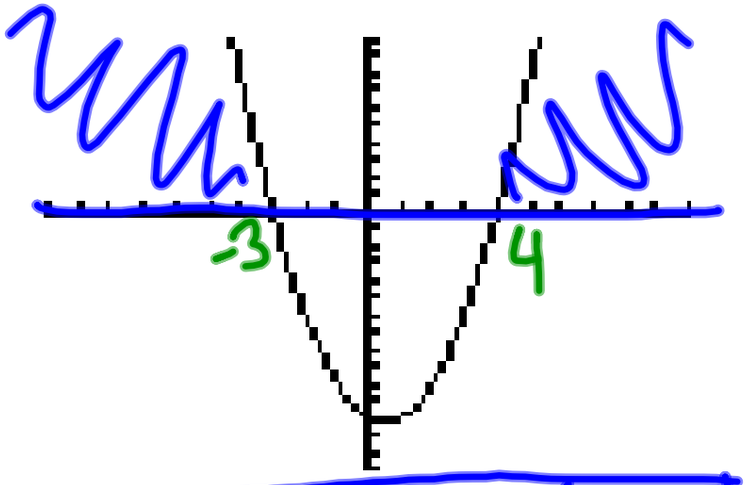
$x^2 - x - 12 = 0$

$(x-4)(x+3) = 0$

$x-4=0 \quad x+3=0$

$x=4 \quad x=-3$

OR



$(-\infty, -3) \cup (4, \infty)$

$$2x^2 + 3x \leq 20$$

$-20 \quad -20$

$2x^2 + 3x - 20 \leq 0$ and

$2x^2 + 3x - 20 = 0$

a 2
b 3
c -20

-40

$-5, 8$

$2x^2 + 8x - 5x - 20 = 0$

$2x(x+4) - 5(x+4) = 0$

$(x+4)(2x-5) = 0$

$x+4=0 \qquad 2x-5=0$

$x = -4 \qquad x = \frac{5}{2}$

2

$\left[-4, \frac{5}{2}\right]$

$$x^2+2x+2<0$$ NO SOLUTION

$x^2+2x+2=0$

$x^2+2x+\frac{1}{\quad}=-2+\frac{1}{\quad}$

$\sqrt{(x+1)^2}=\pm\sqrt{-1}$

$x+1=i$

Find solutions by graphing

$$x^3 + 2x^2 - 1 \geq 0$$