

COLLEGE ALGEBRA

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 Class Time: 11:30-12:45 Date: _____

GPS #23 2.8 ADDITIONAL EQUATIONS AND INEQUALITIES

Useful Guidelines:

* To solve absolute value equations and inequalities:

- 1) $|ax+b|=k$: solve the compound equation $ax+b=k$ or $ax+b=-k$
- 2) $|ax+b|>k$: solve the compound inequality $ax+b>k$ or $ax+b<-k$
- 3) $|ax+b|<k$: solve the compound inequality $-k<ax+b<k$

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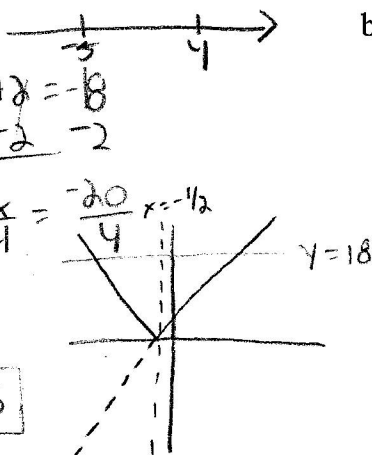
Solve the following absolute value equations and inequalities. Give the solution set in set notation for equations and in interval notation for inequalities. Graph the solution set.

1. a) $|4x+2|=18$

$$4x+2=18 \quad \text{or} \quad 4x+2=-18$$

$$\begin{array}{r} 4x+2=18 \\ -2 \quad -2 \\ \hline 4x=16 \\ \frac{4}{4} \quad \frac{4}{4} \end{array} \quad \text{or} \quad \begin{array}{r} 4x+2=-18 \\ -2 \quad -2 \\ \hline 4x=-20 \\ \frac{4}{4} \quad \frac{4}{4} \end{array}$$

$x=4$ or $x=-5$
 Sol set: $\{x|x=-5, 4\}$

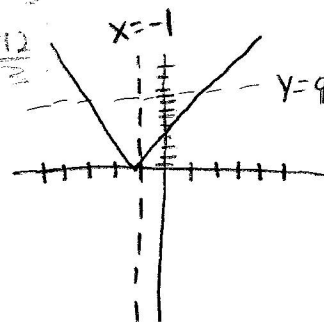


b) $|3x+3|+6=15$

$$3x+3=9 \quad \text{or} \quad 3x+3=-9$$

$$\begin{array}{r} 3x+3=9 \\ -3 \quad -3 \\ \hline 3x=6 \\ \frac{3}{3} \quad \frac{3}{3} \end{array} \quad \text{or} \quad \begin{array}{r} 3x+3=-9 \\ -3 \quad -3 \\ \hline 3x=-12 \\ \frac{3}{3} \quad \frac{3}{3} \end{array}$$

$x=2$ or $x=-4$
 Sol set: $\{x|x=-4, 2\}$



2. a) $|x+1|>6$

$$x+1>6 \quad \text{or} \quad x+1<-6$$

$$\begin{array}{r} x+1>6 \\ -1 \quad -1 \\ \hline x>5 \end{array} \quad \text{or} \quad \begin{array}{r} x+1<-6 \\ -1 \quad -1 \\ \hline x<-7 \end{array}$$

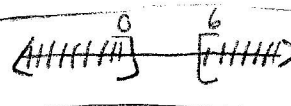
$x>5$ or $x<-7$
~~(|||||) (|||||)~~
~~-7 5~~
 Sol set: $\{x|x<-7$ or $x>5\}$
 Int not: $(-\infty, -7) \cup (5, \infty)$

b) $|3-y|+3 \geq 6$

$$3-y \geq 3 \quad \text{or} \quad 3-y \leq -3$$

$$\begin{array}{r} 3-y \geq 3 \\ -3 \quad -3 \\ \hline -y \geq 0 \\ \frac{-y}{-1} \quad \frac{0}{-1} \end{array} \quad \text{or} \quad \begin{array}{r} 3-y \leq -3 \\ -3 \quad -3 \\ \hline -y \leq -6 \\ \frac{-y}{-1} \quad \frac{-6}{-1} \end{array}$$

$y \leq 0$ or $y \geq 6$
 Int not: $(-\infty, 0] \cup [6, \infty)$
 Sol set: $\{y|y \geq 6$ or $y \leq 0\}$



3. a) $|2x+6|<10$

$$2x+6<10 \quad \text{or} \quad 2x+6>-10$$

$$\begin{array}{r} 2x+6<10 \\ -6 \quad -6 \\ \hline 2x<4 \\ \frac{2}{2} \quad \frac{2}{2} \end{array} \quad \text{or} \quad \begin{array}{r} 2x+6>-10 \\ -6 \quad -6 \\ \hline 2x>-16 \\ \frac{2}{2} \quad \frac{2}{2} \end{array}$$

$x<2$ and $x>-8$
~~(XXXXXXXXXX)~~
~~-8 2~~
 Int not: $(-8, 2)$
 Sol set: $\{x|-8<x<2$ and $x>-8\}$

b) $|x+7| \leq 3$

$$x+7 \leq 3 \quad \text{or} \quad x+7 \geq -3$$

$$\begin{array}{r} x+7 \leq 3 \\ -7 \quad -7 \\ \hline x \leq -4 \end{array} \quad \text{or} \quad \begin{array}{r} x+7 \geq -3 \\ -7 \quad -7 \\ \hline x \geq -10 \end{array}$$

$x \leq -4$ and $x \geq -10$
~~(XXXXXXXXXX)~~
~~-10 -4~~
 Int not: $[-10, -4]$
 Sol set: $\{x|-10 \leq x \leq -4\}$