

Algebra 2  
Solving Equations &  
Systems of Equations

Name \_\_\_\_\_  
Date \_\_\_\_\_ Per \_\_\_\_\_

Solve the following equations and system of equations algebraically.

Ex 1)  $2|2x-6|+4=8$

$$\begin{array}{r} -4 \quad -4 \\ \hline 2|2x-6| = 4 \\ \hline 2 \quad 2 \end{array}$$

$$|2x-6| = 2$$

$$\boxed{x=4 \text{ or } x=2}$$

Ex 2)  $-3\sqrt{2x-1}+4=10$

$$\begin{array}{r} -4 \quad -4 \\ \hline -3\sqrt{2x-1} = 6 \\ \hline -3 \quad -3 \end{array}$$

$$\sqrt{2x-1} = -2$$

**No Real # Solutions**

Ex 3)  $3(x-4)^2+6=33$

$$\begin{array}{r} -6 \quad -6 \\ \hline 3(x-4)^2 = 27 \\ \hline 3 \quad 3 \end{array}$$

$$(x-4)^2 = 9$$

$$\sqrt{(x-4)^2} \quad \sqrt{9}$$

$$|x-4| = 3$$

$$\begin{array}{l} x-4=3 \\ +4+4 \\ \hline x=7 \end{array}$$

$$\begin{array}{l} x-4=-3 \\ +4+4 \\ \hline x=1 \end{array}$$

Ex 4)  $y = -2(x-2)^2 + 35$   
 $y = -2x + 15$

$$\begin{array}{l} -2(x-2)^2 + 35 = -2x + 15 \\ -2(x^2 - 4x + 4) + 35 = -2x + 15 \\ -2x^2 + 8x - 8 + 35 = -2x + 15 \\ -2x^2 + 10x + 12 = 0 \\ 2x^2 - 10x - 12 = 0 \\ (2x+2)(x-6) = 0 \\ \boxed{x=-1} \quad \boxed{x=6} \end{array}$$

$(-1, 17)$   
 $(6, 3)$

Solve the following equations and systems of equations algebraically.

1)  $|3x-7|-5=-3$

$$\begin{array}{r} +5 \quad +5 \\ \hline |3x-7| = 2 \end{array}$$

$$\begin{array}{l} 3x-7=2 \text{ OR } 3x-7=-2 \\ +7 \quad +7 \\ \hline 3x=9 \quad 3x=5 \\ \hline 3 \quad 3 \end{array}$$

$$\boxed{x=3 \text{ OR } x=\frac{5}{3}}$$

3)  $(x-5)^2-4=12$

$$\begin{array}{r} +4+4 \\ \hline (x-5)^2 = 16 \end{array}$$

$$\sqrt{(x-5)^2} = \sqrt{16}$$

$$|x-5| = 4$$

$$x-5=4 \text{ OR } x-5=-4$$

$$\boxed{x=9 \text{ OR } x=1}$$

2)  $\sqrt{x+2}=2x+1$

$$\begin{array}{l} (\sqrt{x+2})^2 = (2x+1)^2 \\ x+2 = 4x^2 + 4x + 1 \\ -x-1 \\ \hline 0 = 4x^2 + 3x - 1 \\ 0 = (4x-1)(x+1) \end{array}$$

$4x-1=0 \quad x+1=0$

$x=\frac{1}{4}$  or  $x=-1$

**EXTRANEIOUS SOLUTION**

4)  $|x+5|=3x-7$

$$x+5 = \pm(3x-7)$$

$$x+5 = 3x-7 \quad \text{OR} \quad x+5 = -3x+7$$

$$12 = 2x$$

$$6 = x$$

$\rightarrow x \neq \frac{1}{2}$

**EXTRANEIOUS SOL.**

$$5) \quad y = (x+1)^2 + 3$$

$$y = 2x+4$$

(0, 4)

$$\begin{aligned} (x+1)^2 + 3 &= 2x+4 \\ x^2 + 2x + 4 &= 2x+4 \\ -2x - 4 &= -2x - 4 \\ \hline x^2 &= 0 \\ x &= 0 \end{aligned}$$

$$6) \quad \begin{array}{l} x+y=0 \\ y=(x-4)^2 - 6 \end{array}$$

(5, -5)

$$\begin{aligned} x+(x-4)^2 - 6 &= 0 \\ x+x^2 - 8x + 16 - 6 &= 0 \\ x^2 - 7x + 10 &= 0 \\ (x-5)(x-2) &= 0 \\ x-5=0 & \quad x-2=0 \\ x=5 & \text{ or } x=2 \end{aligned}$$

$$\begin{array}{l} 2+y=0 \\ y=-2 \end{array}$$

(2, -2)

$$7) \quad \begin{array}{l} 2(15x+10y)=(21)2 \\ -5(6x+4y)=(11)(-5) \end{array} \quad \begin{array}{l} 30x+20y=42 \\ -30x-20y=-11 \\ 0=31 \end{array}$$

NO solutions b/c parallel lines

$$8) \quad \begin{array}{l} 8x+2y=18 \\ (-2)(-6x+y)=(14)(-2) \end{array} \quad \begin{array}{l} 8x+2y=18 \\ 12x-2y=-28 \\ \hline 20x=-10 \end{array}$$

$$\begin{array}{l} 8(-\frac{1}{2})+2y=18 \\ -4+2y=18 \\ 2y=22 \\ y=11 \end{array} \quad \begin{array}{l} 20x=-10 \\ \hline x=-\frac{1}{2} \\ \boxed{(-\frac{1}{2}, 11)} \end{array}$$

$$9) \quad \begin{array}{l} 12x-16y=24 \\ 4(y)=\left(\frac{3}{4}x-\frac{3}{2}\right)4 \end{array} \quad \begin{array}{l} 4y=3x-6 \\ 4(-3x+4y)=(-6)4 \\ -12x+16y=-24 \\ 12x-16y=24 \\ \hline 0=0 \end{array}$$

INFINITELY MANY  
SOLUTIONS b/c coinciding lines.  
(SAME LINE)

11) Solve for y.

$$\begin{array}{l} (x+2)^2 + (y-3)^2 = 36 \\ -(x+2)^2 \quad -(x+2)^2 \\ \hline (y-3)^2 = \sqrt{36-(x+2)^2} \\ |y-3| = \sqrt{36-(x+2)^2} \\ y-3 = \pm \sqrt{36-(x+2)^2} \end{array}$$

$$10) \quad \begin{array}{l} y=\sqrt{x+5} \\ y=x-1 \end{array} \quad \begin{array}{l} (\sqrt{x+5})^2=(x-1)^2 \\ x+5=x^2-2x+1 \\ -x-5=-x-5 \\ \hline 0=x^2-3x-4 \\ 0=(x-4)(x+1) \end{array}$$

$$\begin{array}{l} x-4=0 \quad x+1=0 \\ x=4 \quad x=-1 \\ \text{EXTRANEOUS} \end{array}$$

$$\begin{array}{l} y=4-1 \\ y=3 \end{array}$$

(4, 3)

$$y = \pm \sqrt{36-(x+2)^2} + 3$$