

- 1) Isolate y in at least one equation
- 2) Substitute one equation into the other
- 3) Solve equation (factor)
- 4) Substitute into one of the original equations to find the other variable

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Algebra II



Solving Quadratic Systems Algebraically

Solve each of the following systems of equations for all values of x and y

1. $y = x^2 - 3x + 1$
 $y = -5x + 9$

$x = -4$ $x = 2$
 $y = 5x + 9$ $y = 5x + 9$
 $y = 5(-4) + 9$ $y = 5(2) + 9$
 $y = -29$ $y = -1$

$x^2 - 3x + 1 = -5x + 9$
 $+5x - 9$
 $x^2 + 2x - 8 = 0$
 $(x + 4)(x - 2) = 0$
 $x + 4 = 0$ $x - 2 = 0$
 $-4 - 4$ $2 + 2$
 $x = -4$ $x = 2$

$(-4, -29)$ $(2, -1)$

2. $y = x^2 - 5x + 7$
 $y = -2x + 17$

$-2x + 17 = x^2 - 5x + 7$
 $+2x - 17$
 $0 = x^2 - 3x - 10$
 $0 = (x - 5)(x + 2)$
 $x - 5 = 0$ $x + 2 = 0$
 $+5 + 5$ $-2 - 2$
 $x = 5$ $x = -2$
 $y = -2x + 17$ $y = -2x + 17$
 $y = -2(5) + 17$ $y = -2(-2) + 17$
 $y = 7$ $y = 21$
 $(5, 7)$ $(-2, 21)$

3. $y = x^2 - 5x + 1$
 $y = -5x + 10$

$-5x + 10 = x^2 - 5x + 1$
 $+5x - 10$
 $0 = x^2 - 9$
 $0 = (x + 3)(x - 3)$
 $x + 3 = 0$ $x - 3 = 0$
 $-3 - 3$ $+3 + 3$
 $x = -3$ $x = 3$
 $y = -5x + 10$ $y = -5x + 10$
 $y = -5(-3) + 10$ $y = -5(3) + 10$
 $y = 25$ $y = -5$
 $(-3, 25)$ $(3, -5)$

4. $y = 2x^2 - 7x + 4$
 $y = 11 - 2x$

$11 - 2x = 2x^2 - 7x + 4$
 $+2x - 11$
 $0 = 2x^2 - 5x - 7$
 $0 = x^2 - 5x - 14$
 $0 = (x - 7)(x + 2)$
 $2 2$
 $0 = (2x - 7)(x + 1)$
 $2x - 7 = 0$ $x + 1 = 0$
 $+7 + 7$ $-1 - 1$
 $x = -1$
 $2x = 7$
 $x = \frac{7}{2}$

$x = \frac{7}{2}$ $x = -1$
 $y = 11 - 2x$ $y = 11 - 2x$
 $y = 11 - 2(\frac{7}{2})$ $y = 11 - 2(-1)$
 $y = 4$ $y = 13$
 $(\frac{7}{2}, 4)$ $(-1, 13)$

5. $y = x^2 - 4x + 3$
 $y+1 = x$
 $-1 \quad -1$
 $y = x-1$
 $x-1 = x^2 - 4x + 3$
 $-x+1 \quad -x+1$
 $0 = x^2 - 5x + 4$
 $0 = (x-4)(x-1)$
 $x-4=0 \quad x-1=0$
 $x=4 \quad x=1$
 $y = x-1$
 $y=3 \quad y=0$
 $(4,3) \quad (1,0)$

6. $y = 3x - 1$
 $y+5 = x^2$
 $-5 \quad -5$
 $y = x^2 - 5$
 $x^2 - 5 = 3x - 1$
 $-3x+1 \quad -3x+1$
 $x^2 - 3x - 4 = 0$
 $(x-4)(x+1) = 0$
 $x-4=0 \quad x+1=0$
 $x=4 \quad x=-1$
 $y = 3x-1$
 $y=11 \quad y=-4$
 $(4,11) \quad (-1,-4)$

$x=4 \quad x=-1$
 $y=3x-1 \quad y=3x-1$
 $y=3(4)-1 \quad y=3(-1)-1$
 $y=11 \quad y=-4$
 $(4,11) \quad (-1,-4)$

$y+2$
 $y \quad y^2 \quad 2y$
 $+2 \quad 2y \quad 4$
 $y^2 + 4y + 4$

$(y-4)^2 + y^2 = 10$
 $y^2 - 8y + 16 + y^2 = 10$
 $2y^2 - 8y + 16 = 10$
 $-10 \quad -10$
 $2y^2 - 8y + 6 = 0$
 $\frac{2y^2 - 8y + 6}{2} = 0$
 $y^2 - 4y + 3 = 0$
 $(y-3)(y-1) = 0$
 $y-3=0 \quad y-1=0$
 $y=3 \quad y=1$
 $x = y-4 \quad x = y-4$
 $x=-1 \quad x=-3$
 $(-1,3) \quad (-3,1)$

$(y+2)^2 + y^2 = 2$
 $y^2 + 4y + 4 + y^2 = 2$
 $2y^2 + 4y + 4 = 2$
 $-2 \quad -2$
 $2y^2 + 4y + 2 = 0$
 $\frac{2y^2 + 4y + 2}{2} = 0$
 $y^2 + 2y + 1 = 0$
 $(y+1)(y+1) = 0$
 $y+1=0 \quad y+1=0$
 $y=-1 \quad y=-1$
 $x = y+2 \quad x = y+2$
 $x=1 \quad x=1$
 $(1,1)$

$y+1=0 \quad y+1=0$
 $y=-1 \quad y=-1$
 $x = y+2 \quad x = y+2$
 $x=1 \quad x=1$
 $(1,1)$
 $2x-5$
 $2x \quad 4x^2 \quad -10x$
 $-5 \quad -10x \quad 25$
 $4x^2 - 20x + 25$

9. $x^2 + y^2 = 34$
 $y-x = 2$
 $x \quad x$
 $y = x+2$
 $x^2 + 4x + 4$

10. $x^2 + y^2 = 25$
 $y+5 = 2x$
 $-5 \quad -5$
 $y = 2x-5$

$x^2 + (x+2)^2 = 34$
 $x^2 + x^2 + 4x + 4 = 34$
 $2x^2 + 4x + 4 = 34$
 $-34 \quad -34$
 $2x^2 + 4x - 30 = 0$
 $\frac{2x^2 + 4x - 30}{2} = 0$
 $x^2 + 2x - 15 = 0$
 $(x+5)(x-3) = 0$
 $x+5=0 \quad x-3=0$
 $x=-5 \quad x=3$
 $y = x+2 \quad y = x+2$
 $y=-3 \quad y=5$
 $(-5,-3) \quad (3,5)$

$x^2 + (2x-5)^2 = 25$
 $x^2 + 4x^2 - 20x + 25 = 25$
 $5x^2 - 20x + 25 = 25$
 $-25 \quad -25$
 $5x^2 - 20x = 0$
 $5x(x-4) = 0$
 $5x=0 \quad x-4=0$
 $x=0 \quad x=4$
 $y = 2x-5 \quad y = 2x-5$
 $y=-5 \quad y=3$

$5x^2 - 20x = 0$
 $5x(x-4) = 0$
 $5x=0 \quad x-4=0$
 $x=0 \quad x=4$
 $y = 2x-5 \quad y = 2x-5$
 $y=-5 \quad y=3$

	x	$+2$
x	x^2	$+2x$
$+2$	$+2x$	$+4$

	x	-2
x	x^2	$-2x$
-2	$-2x$	$+4$

	$-x$	-2
$-x$	x^2	$+2x$
-2	$+2x$	$+4$

11. $(x+2)^2 + (y-4)^2 = 40$
 $y = x+2$

$$(x+2)^2 + (x+2-4)^2 = 40$$

$$(x+2)^2 + (x-2)^2 = 40$$

$$x^2 + 4x + 4 + x^2 - 4x + 4 = 40$$

$$2x^2 + 8 = 40$$

$$\frac{2x^2 - 32}{2} = 0$$

$$x^2 - 16 = 0$$

13. $x+y=5$
 $(x+3)^2 + (y-3)^2 = 53$

$$(x+3)^2 + (5-x-3)^2 = 53$$

$$(x+3)^2 + (2-x)^2 = 53$$

$$x^2 + 6x + 9 + x^2 - 4x + 4 = 53$$

$$2x^2 + 2x + 13 = 53$$

$$\frac{2x^2 + 2x - 40}{2} = 0$$

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

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

$$x+5=0 \quad x-4=0$$

$$x=-5 \quad x=4$$

	x	$+3$
x	x^2	$+3x$
$+3$	$+3x$	$+9$

	2	$-x$
2	4	$-2x$
$-x$	$-2x$	x^2

$$x=-5 \quad x=4$$

$$y=5-x \quad y=5-x$$

$$y=5+5 \quad y=5-4$$

$$y=10 \quad y=1$$

$$(-5, 10) \quad (4, 1)$$

12. $(x-2)^2 + (y-3)^2 = 16$

$$x+y-1=0$$

$$-x+1-x+1$$

$$y = x+1$$

$$(x-2)^2 + (-x+1-3)^2 = 16$$

$$(x-2)^2 + (-x-2)^2 = 16$$

$$x^2 - 4x + 4 + x^2 + 4x + 4 = 16$$

$$2x^2 + 8 = 16$$

$$\frac{2x^2 - 8}{2} = 0$$

14. $(x-3)^2 + (y+2)^2 = 16$

$$2x+2y=10$$

$$-2x-2x$$

$$\frac{2y = -2x+10}{2}$$

$$y = -x+5$$

$$(x-3)^2 + (-x+5+2)^2 = 16$$

$$(x-3)^2 + (-x+7)^2 = 16$$

$$x^2 - 6x + 9 + x^2 - 14x + 49 = 16$$

$$2x^2 - 20x + 58 = 16$$

$$\frac{2x^2 - 20x + 42}{2} = 0$$

$$x^2 - 10x + 21 = 0$$

$$(x-7)(x-3) = 0$$

$$x-7=0 \quad x-3=0$$

$$+7+7 \quad +3+3$$

$$x=7 \quad x=3$$

$$x^2 - 4 = 0$$

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

$$x+2=0 \quad x-2=0$$

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

$$x=-2 \quad x=2$$

$$y=x+1 \quad y=-x+1$$

$$y=2+1 \quad y=-2+1$$

$$y=3 \quad y=-1$$

$$(-2, 3) \quad (2, -1)$$

	x	-3
x	x^2	$-3x$
-3	$-3x$	$+9$

$$x^2 - 6x + 9$$

	$-x$	$+7$
$-x$	x^2	$-7x$
$+7$	$-7x$	$+49$

$$x^2 - 14x + 49$$

$$x=7 \quad x=3$$

$$y=-x+5 \quad y=-x+5$$

$$y=-7+5 \quad y=-3+5$$

$$y=-2 \quad y=2$$

$$(7, -2) \quad (3, 2)$$