7.1 Solving Systems by Substitution

We already learned how to solve systems of equations by graphing. Now we are going to solve systems of equations by a method called substitution.

Steps to solving by substitution

1) Get a variable by itself
2) Plug in to other equation
3) Solve
4) Plug solution into original equation to solve for other variable

1. Practice with Linear Systems of Equations:

a) $y = -2x + 4$

$-7x - 3y = -12$

$-7x - 3(-2x+4) = -12$

$-7x + 6x - 12 = -12$

$-x - 12 = -12$

$+12 \quad +12$

$-x = 0$

$x = 0$

$y = -2(0) + 4 = 4$

$(0, 4)$

b) $-x + y = 1$

$-4x + 8y = -24$

b) $6x + y = 16$

$-6x \quad -6x$

$-8x - 3y = -8$

$y = 16 - 6x$

$-8x - 3(16-6x) = -8$

$-8x - 48 + 18x = -8$

$10x - 48 = -8$

$+48 \quad +48$

$10x = 40$

$x = 4$

$y = 16 - 6(4) = 16 - 24 = -8$

$(4, -8)$

d) $3x + 7y = 23$

$-4x - y = 11$

* Get everything on one side

2. Practice with Quadratic Systems of Equations:

a) $y = x^2 - 11x + 28$

$y = -3x + 12$

$x^2 - 11x + 28 = -3x + 12$

$+3x \quad -12 \quad +3x \quad -12$

$x^2 - 8x + 16 = 0$ $\quad 16x^2$, $-4x$, $-4x$

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

$x = 4, 4$

$x = 4$ $\quad y = -3(4) + 12$

$= -12 + 12$

$= 0$

$(4, 0)$

b) $y = 2x^2 + 13x + 15$

$y = x - 1$

$2x^2 + 13x + 15 = x - 1$ *

$-x \quad +1 \quad -x \quad +1$

$2x^2 + 12x + 16 = 0$

$2(x^2 + 6x + 8) = 0$ $\quad 8x^2$, $2x$, $4x$

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

$x = -2, -4$

$x = -2$ $\quad y = -2 - 1 = -3$

$x = -4$ $\quad y = -4 - 1 = -5$

$(-2, -3)$

$(-4, -5)$

c) $x^2 + y^2 = 25$

$y = 2x - 10$

$x^2 + (2x-10)^2 = 25$

$x^2 + (2x-10)(2x-10) = 25$

$x^2 + 4x^2 - 20x - 20x + 100 = 25$

$-25 \quad -25$

$5x^2 - 40x + 75 = 0$

$5(x^2 - 8x + 15) = 0$ $\quad 15x^2$, $-3x$, $-5x$

$5(x-3)(x-5) = 0$

$x = 3, 5$

$x = 3$

$y = 2(3) - 10$

$= 6 - 10$

$= -4$

$x = 5$

$y = 2(5) - 10$

$= 10 - 10$

$= 0$

$(3, -4)$

$(5, 0)$

d) $x^2 + y^2 = 68$

$y = -4x$

$x^2 + (-4x)^2 = 68$

$x^2 + 16x^2 = 68$

$\frac{17x^2}{17} = \frac{68}{17}$

$\sqrt{x^2} = \sqrt{4}$ *

$x = \pm 2$

$x = 2$

$y = -4(2) = -8$

$x = -2$

$y = -4(-2) = 8$

$(2, -8)$

$(-2, 8)$

* If you take a $\sqrt{\ }$, your answer needs to be $\pm$

Methods to solving quadratics		
1) Factoring	2) Complete the square	3) Quadratic formula