Name Key
8A; Algebra 1

Date _____
Period _____

How Do We Solve A Linear-Quadratic System Algebraically?

To obtain an algebraic solution for a linear-quadratic system:

1. *Rewrite the linear equation* so that one variable is expressed in terms of the other, for example, *y* in terms of *x*.
2. *Substitute the expression for y* obtained from the linear equation into the quadratic equation, thus obtaining a quadratic equation in one variable, x.
3. *Solve the quadratic equation* in one variable, thus obtaining two values for x.
4. *Substitute each value of x* into the linear equation to obtain the corresponding *y* – values.
5. *Check both sets* of ordered pairs in each of the original equations.

Transitive Property

Examples: Solve the following systems of equations and check.

1) $y = x^2 - 4x + 3$
$y = 2x - 2$

$x^2 - 4x + 3 = 2x - 2$
$-2x + 2 \quad -2x + 2$

$x^2 - 6x + 5 = 0$
$(x - 5)(x - 1) = 0$

$x - 5 = 0$	$x - 1 = 0$
$+5 \quad +5$	$+1 \quad +1$
$x = 5$	$x = 1$

$x = 5$
$y = 2x - 2$
$y = 2(5) - 2$
$y = 10 - 2$
$y = 8$
(5, 8)

$x = 1$
$y = 2x - 2$
$y = 2(1) - 2$
$y = 2 - 2$
$y = 0$
(1, 0)

(5, 8)
$y = x^2 - 4x + 3$
$8 = (5)^2 - 4(5) + 3$
$8 = 25 - 4(5) + 3$
$8 = 25 - 20 + 3$
$8 = 8$

(5, 8)
$y = 2x - 2$
$8 = 2(5) - 2$
$8 = 10 - 2$
$8 = 8$ ✓

(1, 0)
$y = x^2 - 4x + 3$
$0 = (1)^2 - 4(1) + 3$
$0 = 1 - 4(1) + 3$
$0 = 1 - 4 + 3$
$0 = 0$

(1, 0)
$y = 2x - 2$
$0 = 2(1) - 2$
$0 = 2 - 2$
$0 = 0$

must be original equations

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

$x + 3 = 0$	$x - 1 = 0$
$-3 \quad -3$	$+1 \quad +1$
$x = -3$	$x = 1$

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

$x = 1$
$y - x = 4$
$y - 1 = 4$
$+1 \quad +1$
$y = 5$
(1, 5)

(−3, 1)
$y = x^2 + 3x + 1$
$1 = (-3)^2 + 3(-3) + 1$
$1 = 9 + 3(-3) + 1$
$1 = 9 - 9 + 1$
$1 = 1$

(−3, 1)
$y - x = 4$
$1 - (-3) = 4$
$1 + 3 = 4$
$4 = 4$ ✓

must be original

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

(1, 5)
$y - x = 4$
$5 - 1 = 4$
$4 = 4$

3) $y = x^2 + 3x - 7$

$y - 3x = 9$

$y = 3x + 9$

$x^2 + 3x - 7 = 3x + 9$

$-3x - 9 \quad -3x + 9$

$x^2 - 16 = 0$

$+16 \quad +16$

$\sqrt{x^2} = \sqrt{16}$

$x = +4$

$x = -4$

OR →

$x^2 - 16 = 0$

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

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

$x = 4$

$y - 3x = 9$

$y - 3(4) = 9$

$y - 12 = 9$

$+12 \quad +12$

$y = 21$

$(4, 21)$

$x = -4$

$y - 3x = 9$

$y - 3(-4) = 9$

$y + 12 = 9$

$-12 \quad -12$

$y = -3$

$(-4, -3)$

$(4, 21)$

$y = x^2 + 3x - 7$

$21 = (4)^2 + 3(4) - 7$

$21 = 16 + 3(4) - 7$

$21 = 16 + 12 - 7$

$21 = 21$ ✓

$(4, 21)$

$y - 3x = 9$

$21 - 3(4) = 9$

$21 - 12 = 9$

$9 = 9$ ✓ ○

$(-4, -3)$

$y = x^2 + 3x - 7$

$-3 = (-4)^2 + 3(-4) - 7$

$-3 = 16 + 3(-4) - 7$

$-3 = 16 - 12 - 7$

$-3 = -3$

$(-4, -3)$

$y - 3x = 9$

$-3 - 3(-4) = 9$

$-3 + 12 = 9$

$9 = 9$ ✓

4) $y = x^2 - 4x - 2$

$y = x - 2$

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

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

$x^2 - 5x = 0$

$x(x-5) = 0$

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

$x = 0$

$y = x - 2$

$y = 0 - 2$

$y = -2$

$(0, -2)$

$x = 5$

$y = x - 2$

$y = 5 - 2$

$y = 3$

$(5, 3)$

$(0, -2)$

$y = x^2 - 4x - 2$

$-2 = (0)^2 - 4(0) - 2$

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

$-2 = 0 - 0 - 2$

$-2 = -2$ ✓

$(0, -2)$

$y = x - 2$

$-2 = 0 - 2$

$-2 = -2$ ✓

$(5, 3)$

$y = x^2 - 4x - 2$

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

$3 = 25 - 4(5) - 2$

$3 = 25 - 20 - 2$

$3 = 3$

$(5, 3)$

$y = x - 2$

$3 = 5 - 2$

$3 = 3$ ✓ ○

5) $x + y = 1$

$y = -x^2 + 4x - 3$

$x + y = 1$

$-x \quad -x$

$y = -x + 1$ ← Now Negative x^2, you can't factor that

$-x^2 + 4x - 3 = -x + 1$

$+x^2 \quad -4x + 3 \quad -4x + 3 \quad +x^2$

$0 = x^2 - 5x + 4$

$x^2 - 5x + 4 = 0$

$(x-4)(x-1) = 0$

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

$x = 4$

$x + y = 1$

$4 + y = 1$

$-4 \quad -4$

$y = -3$

$(4, -3)$

$x = 1$

$y = -x^2 + 4x - 3$

$y = -(1)^2 + 4(1) - 3$

$y = -1 + 4(1) - 3$

$y = -1 + 4 - 3$

$y = 0$

$(1, 0)$

$(4, -3)$

$x + y = 1$

$4 + (-3) = 1$

$4 - 3 = 1$

$1 = 1$

$(1, 0)$

$x + y = 1$

$1 + 0 = 1$

$1 = 1$ ✓

$(4, -3)$

$y = -x^2 + 4x - 3$

$-3 = -(4)^2 + 4(4) - 3$

$-3 = -(16) + 4(4) - 3$

$-3 = -16 + 4(4) - 3$

$-3 = -16 + 16 - 3$

$-3 = -3$ ✓

$(1, 0)$

$y = -x^2 + 4x - 3$

$0 = -(1)^2 + 4(1) - 3$

$0 = -(1) + 4(1) - 3$ ○

$0 = -1 + 4(1) - 3$

$0 = -1 + 4 - 3$

$0 = 0$ ✓