NOTES 8-1

ALGEBRA II UNIT 8 Graphing Quadratics and Quadratic/Linear Systems

Steps for solving quadratic & linear systems using SUBSTITUTION:

- Step 1: Isolate *y* in both equations.
- Step 2: Set the linear and quadratic equations equal to each other
  - The resulting equation should have only one variable, *x*
- Step 3: Solve the new equation. This will give you two x-coordinates.
- Step 4: Substitute the results from Step 3 into the linear equation.
- Step 5: Solve for the *y* coordinates.
- Step 6: Write the solutions as two ordered pairs. *(x, y)* & *(x, y)*

Solving quadratic systems by substitution:

1. $y = x^2 - x$

   $y = -x + 4$

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

$+x \quad -4 \quad +x \quad +4$

$x^2 - 4 = 0$

* Diff. of Squares $(x+2)(x-2) = 0$

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

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

$x = -2 \qquad x = 2$

$y = -x + 4 \qquad y = -x + 4$

$y = -(-2) + 4 \qquad y = -(2) + 4$

$y = 2 + 4 \qquad y = -2 + 4$

$y = 6 \qquad y = 2$

Solutions: (−2, 6) & (2, 2)

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

   $y - x + 1 = 5$ → $y = x + 4$

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

$-x \quad -4 \quad -x \quad +4$

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

$x(x+2) = 0$

$x = 0 \qquad x+2=0$

$-2 \quad -2$

$x = -2$

$y = x + 4 \qquad y = x + 4$

$y = 0 + 4 \qquad y = -2 + 4$

$y = 4 \qquad y = 2$

Solutions: (0, 4) & (−2, 2)

$y = 4x^2 + 49x + 126$

3. $0 = 4x^2 + 49x - y + 126$

$+y \qquad +y$

$x - y = 2$

$-x \qquad -x$

$\frac{-y}{-1} = \frac{-x+2}{-1}$

$y = x - 2$

$4x^2 + 49x + 126 = x - 2$

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

$\frac{4x^2 + 48x + 128}{4} = 0$ GCF

32	12
X	+
1·32	
2·16	
4·8	4+8

$4(x^2 + 12x + 32) = 0$

$4(x+4)(x+8) = 0$

$x = -4 \qquad x = -8$

$y = x - 2 \qquad y = x - 2$

$y = -4 - 2 \qquad y = -8 - 2$

$y = -6 \qquad y = -10$

Solutions: $(-4, -6)$ and $(-8, -10)$

4. $y = x^2 + 5x - 4$

$\frac{2y}{2} = \frac{4}{2} \rightarrow y = 2$

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

$-2 \quad -2$

$x^2 + 5x - 6 = 0$

-6	5
X	+
-1·6	-1+6
2·3	

$(x-1)(x+6) = 0$

$x = 1 \qquad x = -6$

$y = 2$

Solutions: $(1, 2)$ and $(-6, 2)$

NOTES 8-2

ALGEBRA II UNIT 8 Graphing Quadratics and Quadratic/Linear Systems

1. The height, **h**, of a baseball, in meters at the time, **t**, seconds after it is tossed out of a window is modelled by height $\mathbf{h = -2t^2 + 11t + 6}$. Mason shoots at the baseball with a paintball gun. The trajectory of the paintball is given by the equation $\mathbf{h = 9t + 2}$.

$-2t^2 + 11t + 6 = 9t + 2$

$+2t^2 \quad -11t \quad -6 \quad +2t^2 \quad -11t \quad -6$

$0 = \frac{2t^2 - 2t - 4}{2}$

$0 = 2(t^2 - 1t - 2)$

$0 = 2(t-2)(t+1)$

$t = 2 \quad t = -1$

-2	-1
$\times$	$\pm$
$-2 \cdot 1$	$-2+1$

What are the **t** values for this system? **t =** 2 **t =** −1

Are both reasonable solutions? If not, why?

No, −1 second isn't possible

Use the reasonable **t** value to find the intersection point

$h = 9t + 2$

$h = 9(2) + 2$

$h = 18 + 2 \quad h = 20$

Find the intersection point/s: (2, 20)
(t, h)

When will the paint ball and baseball hit? After 2 seconds.
(x value)

At what height will the two objects hit? 20 meters off the ground.
(y value)

2. Eddie jumps off the Transco Tower and falls freely for several seconds before releasing his parachute. His height, **h**, in meters, t seconds after jumping can be modelled by: **$h = -12t^2 - 20t + 56$** before he releases his parachute and **$h = -8t + 32$** after he released his parachute.

$-12t^2 - 20t + 56 = -8t + 32$

$+12t^2 + 20t - 56 \quad +12t^2 + 20t - 56$

$$0 = \frac{12t^2 + 12t - 24}{12}$$

$0 = 12(t^2 + t - 2)$

$0 = (t + 2)(t - 1)$

$t = -2 \quad t = 1$

-2	1
X	+
$2 \cdot -1$	$2 + -1$

What are the **t** values for this system? **t =** -2 **t =** 1

Are both reasonable solutions? If not, why?

No, -2 seconds isn't possible

Use the reasonable **t** value to find the intersection point

$h = -8t + 32$

$h = -8(1) + 32$

$h = -8 + 32$

$h = 24$

Find the intersection point/s: $(1, 24)$

How long after jumping, did Eddie release his parachute? After 1 seconds.

How high was he off the ground? 24 meters off the ground.

3. A rocket is launched from the ground. The height, **y**, in feet after **x** seconds is represented by the equation $y = -x^2 + 12x$. At the same time a flare is launched from a height of 12 feet and follows a straight path represented by the equation $y = -x + 12$.

$-x^2 + 12x = -x + 12$

$+x^2 \quad -12x \quad +x^2 \quad -12x$

$0 = x^2 - 13x + 12$

$0 = (x-1)(x-12)$

$x = 1 \qquad x = 12$

12	-13
X	+
$-1 \cdot -12$	$-1 + -12$
$2 \cdot 6$	
$3 \cdot 4$	

How many times will the paths of the rocket and flare cross? 2

$y = -x + 12$

$y = -(1) + 12$

$y = -1 + 12$

$y = 11$

$y = -x + 12$

$y = -(12) + 12$

$y = 0$

Find the intersection point/s: (1, 11) & (12, 0)

After 1 seconds both the rocket and the flare were at a height of 11 feet.

After 12 seconds both the rocket and the flare were at a height of 0 feet.