Solving Systems of Equation Using Elimination

SOLVING SYSTEMS OF EQUATIONS:

- So far, we have solved systems using graphing and substitution. We will now solve systems algebraically using elimination with addition and subtraction/
- The equations in the system must be in standard form in order to use elimination.
- Standard Form: $Ax + By = C$

EXAMPLE 1:

Solve the system using elimination: $x + y = 5$, $3x - y = 7$

Step 1: Put the equations in Standard Form

They already are

Step 2: Determine which variable to eliminate

The y have the same coefficient.

Step 3: Add or subtract the equations

Add to eliminate y (different signs)

$$x + y = 5$$
$$+\ 3x - y = 7$$
$$4x = 12$$
$$x = 3$$

Step 4: Plug back in to find the other variable

$x + y = 5$

$3 + y = 5$

$y = 2$

(3, 2)

EXAMPLE 2:

Solve the system using elimination: $4x + y = 7$, $4x - 2y = -2$

Step 1: Put the equations in Standard Form

They already are

Step 2: Determine which variable to eliminate

The x have the same coefficient.

Step 3: Add or subtract the equations

Subtract to eliminate x (same sign)

$$4x + y = 7$$
$$-\ 4x + 2y = -2$$
$$3y = 9$$
$$y = 3$$

Step 4: **Plug back in to find the other variable**

$4x+y=7$
$4x+3=7$
$-3 \quad -3$
$4x=4$
$x=1$
$(1, 3)$
$x \quad y$

*Change all the signs for 2nd equation, then Add.

SOLVING A SYSTEM OF EQUATIONS BY ELIMINATION USING MULTIPLICATION

EXAMPLE 3:

Solve the system using elimination: $\begin{matrix} 2x+2y=6 \\ 3x-y=5 \end{matrix}$

Step 1: **Put the equations in Standard Form**

They already are.

Step 2: **Determine which variable to eliminate**

None of the coefficients are the Same
Find the least common multiple
LCM = $6x$ LCM = $2y$
Which is easier to obtain? $2y$
b/c one equation has $2y$

Step 3: **Multiply the equations and then add**

Multiply the 2nd equation by 2

$2(3x-y=5)$
$6x-2y=10$
$+ \quad 2x+2y=6$
$8x=16$
$x=2$

Step 4: **Plug back in to find the other variable**

$2x+2y=6$
$2(2)+2y=6$
$4+2y=6$
$2y=2$
$y=1$
$(2, 1)$

EXAMPLE 4:

Solve the system using elimination: $\begin{matrix} x = -4y + 7 \\ 4x - 3y = 9 \end{matrix}$

Step 1: **Put the equations in Standard Form**

$x = -4y + 7$

$+4y \quad +4y$

$x + 4y = 7$

Step 2: **Determine which variable to eliminate**

Find the LCM

LCM = $4x$ LCM = $12y$

Which is easier to obtain? y $4x$

Step 3: **Multiply the equations and then add**

Multiply the 1st equation by -4

$-4(x + 4y = 7)$

$-4x - 16y = -28$

$+ \quad 4x - 3y = 9$

$-19y = -19$

$y = 1$

Step 4: **Plug back in to find the other variable**

$x + 4y = 7$

$x + 4(1) = 7$

$x + 4 = 7$

$x = 3$

$(3, 1)$