7.4 Solve Linear Systems by Multiplying First

Goal • Solve linear systems by multiplying first.

Your Notes

Example 1 *Multiply one equation, then add*

Solve the linear system: $3x - 3y = 21$ **Equation 1**

$8x + 6y = -14$ **Equation 2**

Solution (LONGWAY) LOOK AT THE x VARIABLE

1. **Multiply** Equation 1 by 8 AND EQUATION 2 BY -3.

$8(3x - 3y = 21) \rightarrow 24x - 24y = 168$

$-3(8x + 6y = -14) \rightarrow -24x - 18y = 42$

0 +

2. **Add** the equations.

$-42y = 210$

$-42 \quad -42$

3. **Solve for** y.

$y = -5$

FIND X:

4. **Substitute** $y = -5$ in either of the original equations and solve.

$8x + 6(-5) = -14$

$8x - 30 = -14$

$+30 \quad +30$

$\frac{8x}{8} = \frac{16}{8}$

$x = 2$

The solution is (2, -5).

CHECK Substitute 2 for x and -5 for y in the original equations.

Equation 1: $3x - 3y = 21$

$3(2) - 3(-5) = 21$

$21 = 21$ ✓

Equation 2: $8x + 6y = -14$

$8(2) + 6(-5) = -14$

$-14 = -14$ ✓

SHORT CUT

$2(3x - 3y = 21) \rightarrow 6x - 6y = 42$

$8x + 6y = -14 \rightarrow 8x + 6y = -14$

0 +

3RD ELIMINATION METHOD

Goal is to look at 1 variable and multiply each COEF. so that the COEF'S ARE OPPOSITES BECAUSE!! IF THE COEF'S FOR 1 VARIABLE ARE OPPOSITES THEN WE CAN "ADD" DOWN. to eliminate one variable.

Your Notes

Example 2 *Multiply both equations, then subtract*

Solve the linear system: $3y = -2x + 17$ Equation 1
$3x + 5y = 27$ Equation 2

EQUATIONS MUST BE IN STANDARD FORM

Solution

1. Arrange the equations so that like terms are in columns. [AX+BY=C]

$2x + 3y = 17$ ← ORIG EQ'S
$3x + 5y = 27$

2. Multiply Equation 1 by 3 and Equation 2 by −2 so that the coefficient of x in each equation is the OPPOSITE of 2 and 3, or 6.

$(2x + 3y = 17) \times 3 \rightarrow 6x + 9y = 51$

$(3x + 5y = 27) \times -2 \rightarrow -6x + (-10y) = -54$

3. ADD the equations.

4. Solve for Y.

$+y = -3$

$y = -3$

5. Substitute $y = -3$ in either of the original equations and solve for X.

$2x + 3(3) = 17$
$2x + 9 = 17$
$-9 \quad -9$
$2x = 8$
$x = 4$

The solution is (4, 3).

6. CHECK:

C: $2(4) + 3(3) = 17$
$17 = 17$ ✓

C: $3(4) + 5(3) = 27$
$27 = 27$ ✓

Checkpoint **Solve the linear system using elimination.**

QUESTION
How to mult EQ's so 1 COEF. IS OPPOSITES

2) $(-9x + 5y = -8) \times -2 \rightarrow 18x - 10y = 16$
$-20x + 10y = -10 \rightarrow -20x + 10y = -10$

$-2x = 6$
$x = -3$

FIND Y:

$-9(-3) + 5y = -8$
$27 + 5y = -8$
$-27 \quad -27$
$5y = -35$
$y = -7$

Check in Both Orig EQ's

C: $-9(-3) + 5(-7) = -8$
$-8 = -8$ ✓

C: $-20(-3) + 10(-7) = -10$
$-10 = -10$ ✓