Lesson Five – Solve Systems with Elimination

Steps

1. Arrange the equations with like terms in columns.
2. Make the coefficients of x or y the same by multiplying each term of one or both equations by an appropriate number.
3. Add or subtract the equations and solve for the remaining variable.
4. Substitute the value obtained in Step 3 into either of the original equations and solve for the other variable.
5. Check the solution in each of the original equations.

Example: Solve using Elimination

$(x + 2y) = (10)$ (×2, ×2)
$-2x + 3y = 15$

Step 1: Multiply the first equation by 2.

$2x + 4y = 20$

Step 2: Add the two equations to get 0x or 0 and eliminate x (signs are opposite 2x, −2x)

$$\begin{array}{rl} & 2x + 4y = 20 \\ + & -2x + 3y = 15 \\ \hline & 7y = 35 \\ & y = 5 \end{array}$$

Step 3: Substitute $y = 5$ into one of the two original equations and solve for x.

$x + 2y = 10$
$x + 2(5) = 10$
$x = 0$

∴ sol'n (0, 5)

Check:

$x + 2y = 10$
$0 + 2(5) = 10$
$10 = 10$ ✓

$-2x + 3y = 15$
$-2(0) + 3(5) = 15$
$15 = 15$ ✓

Example 2: Solve using Elimination

$2y + 4x = 1$ ×3
$3y + 3x = 3$ ×(-2)

$6y + 12x = 3$
$+ \quad -6y - 6x = -6$
$6x = -3$
$x = -\frac{1}{2}$

← make the coefficients opposite signs so you can add to eliminate y (otherwise, subtract)

sub $x = -\frac{1}{2}$ into
$2y + 4x = 1$
$2y + 4\left(-\frac{1}{2}\right) = 1$
$2y - 2 = 1$
$2y = 3$
$y = \frac{3}{2}$

sol'n $\left(-\frac{1}{2}, \frac{3}{2}\right)$ independent system

Example 3: Parallel Lines

$y = 2.5x - 3$ (-2)
$2y = 5x + 4$

$-2y = -5x + 6$
$+ \quad 2y = 5x + 4$
$0 \neq 10$

No sol'n
inconsistent system

Example 4

$2y = 6x + 4$ ÷2
$y = 3x + 2$

divide by 2
$y = 3x + 2$
same line

$y = 3x + 2$
$-(y = 3x + 2)$
$0 = 0$ ✓

OR
$2y = 6x + 4$
$-2y = -6x - 4$
$0 = 0$ ✓

∴ same line
infinite # of sol'ns
along the line $y = 3x + 2$

dependent system

Assignment: Pg. 437; 3, 7, 10, 20

3 methods

Lesson 2 Graphing

Lesson 4 Substitution

Lesson 5 Elimination

Lesson 1 Notes

3 Types of Systems

Independent → sol'n is 1 point

Dependent → exact same line

Inconsistent → No sol'n
parallel lines