

## Lesson 3 Solving Systems Using Elimination

### Steps

1. Arrange the equations with like terms in columns.
2. Use multiplication/division to make the coefficients of  $x$  or  $y$  the same value.
3. Add/subtract the equations to eliminate one variable 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. (optional)

### Example 1

Solve, algebraically.

$$x + 2y = 10 \quad \textcircled{1}$$

$$-2x + 3y = 15 \quad \textcircled{2}$$

Mult  $\textcircled{1}$  by 2

~~$$2x + 4y = 20$$~~

~~$$-2x + 3y = 15$$~~

add  
 $\textcircled{1} + \textcircled{2}$

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$$7y = 35$$

$$y = 5$$

sub  $y = 5$  into  $\textcircled{1}$

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

$$x = 0$$

sol'n  
 $(0, 5)$

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## Pre-Calculus 10 Enriched Systems of Linear Equations

### Example 2

Solve, algebraically.

$$2y + 4x = 1$$

$$\frac{3y + 3x = 3}{3 \quad 3 \quad 3}$$

$$y + x = 1$$

mult ②  
by (-2)

$$-2y - 2x = -2$$

$$2y + 4x = 1$$

add

$$2x = -1$$

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

sub into ①

$$2y + 2\left(-\frac{1}{2}\right) = 1$$

$$2y - 2 = 1$$

$$2y = 3$$

$$y = \frac{3}{2}$$

### Example 3

Solve, algebraically.

$$y = 2.5x - 3$$

$$2y = 5x + 4$$

mult  
① by -2

$$-2y = -5x + 6$$

$$+ (2y = 5x + 4)$$

add

$$0 \neq 10$$

∴ No sol'n

Types of systems

- Consistent
  - Independent  $\rightarrow$  sol'n is 1 point
  - Dependent  $\rightarrow$  infinite # of sol'ns along the line  
(eqns represent same line)
- Inconsistent  $\rightarrow$  No sol'n  
(parallel lines, same slope)

Three Methods

- Solving graphically
- Solving algebraically
  - Using Substitution
  - Using Elimination

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## Pre-Calculus 10 Enriched Systems of Linear Equations

### Example 4

Solve, algebraically.

①  $2y = 6x + 4$

②  $y = 3x + 2$

mult  
by -2 →

$$\begin{array}{r} \cancel{2y} = 6x + 4 \\ -2y = -6x - 4 \\ \hline 0 = 0 \quad \checkmark \end{array}$$

∴ infinite # of solns along  
the line  $y = 3x + 2$

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# 2a, c, f, h, j, k, l, m, r, t