

2 Elimination

April 13, 2022 2:45 PM

Linear Algebra

PRE-CALCULUS 11

Chapters 8-9 – Day 2: SOLVING SYSTEMS OF EQUATIONS BY ELIMINATION

SOLVING SYSTEMS OF EQUATIONS WITH THE ELIMINATION METHOD

To solve a system of equations algebraically using The Elimination Method:

1. Write both equations so that like-terms line up.
2. Eliminate one of the variables by adding (subtracting) the equations; all the terms of one of the variables must be eliminated.
 - a. The coefficients of the eliminated terms must have opposite (equal) values.
 - b. It may be necessary to multiply one or both equations to get suitable coefficients.
3. Solve this equation; find the roots - the values of this first variable.
4. Substitute each of these roots into an equation with both variables.
5. Solve these equations; find the value of the second variable.

Example 1: Use the Elimination Method to solve the system of equations $3x + 2y = 2$ and $4x + 5y = 12$.

① Line up like terms vertically

$$\begin{array}{r} \text{Eq 1: } 3x + 2y = 2 \\ \text{Eq 2: } 4x + 5y = 12 \end{array}$$

multiply each term by 5

$$\begin{array}{r} 15x + 10y = 10 \\ -8x - 10y = -24 \\ \hline 7x = -14 \\ x = -2 \end{array}$$

② Multiply the equations so you get the same # of y's but opposite signs!

③ Add vertically: y's disappear!

④ solve for x

⑤ Find corresponding y.

Plug $x = -2$ into $3x + 2y = 2$

$$\begin{array}{r} 3(-2) + 2y = 2 \\ -6 + 2y = 2 \\ +6 \quad +6 \\ \hline 2y = 8 \\ y = 4 \end{array}$$

$\{(-2, 4)\}$

$$\left[\begin{array}{cc|c} 3 & 2 & 2 \\ 4 & 5 & 12 \end{array} \right] \begin{array}{l} M5 \\ M(-2) \end{array}$$

$$\left[\begin{array}{cc|c} 15 & 10 & 10 \\ -8 & -10 & -24 \end{array} \right]$$

$$\left[\begin{array}{cc|c} 7 & 0 & -14 \end{array} \right] \div 7$$

$$\left[\begin{array}{cc|c} 1 & 0 & -2 \end{array} \right]$$

$$x = -2$$

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Example 2: Use the Elimination Method to solve the system of equations

$$\begin{array}{r} \text{Eq 1: } x^2 - y = 5 \\ \text{Eq 2: } x^2 - 2y = 4 \end{array}$$

$$\begin{array}{r} \text{Eq 1: } x^2 - y = 5 \\ \text{Eq 2: } x^2 - 2y = 4 \end{array} \quad \begin{array}{l} \text{Line up like} \\ \text{terms vertically!} \end{array}$$

Example 3: Use the Elimination Method to solve the system of equations

$$\begin{array}{r} x^2 - 4x - y + 2 = 0 \\ 3x + 2y - 11 = 0 \end{array}$$

Eq 1: $x^2 - y = 5$ and $x^2 - 2y = 4$.

Eq 2: $x^2 - y = 5$ and $x^2 - 2y = 4$
 $x^2 - y = 5$
 $x^2 - 2y = 4$
 Line up like terms vertically!

$$\begin{array}{r} -2x^2 + 2y = -10 \\ x^2 - 2y = 4 \\ \hline -x^2 = -6 \end{array}$$

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

$$2x^2 - x = 6$$

$$(2x^2 - x) - (-x^2 + x) = 6 - (-6)$$

$$3x^2 - 2x = 12$$

$$3x^2 - 2x = 12$$

$$3x^2 - 2x = 12$$

$$3x^2 - 2x = 12$$

$$3x^2 - 2x = 12$$

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equations

$x^2 - 4x - y + 2 = 0$ and
 $3x + 2y - 11 = 0$

6

1

7



$\{(-1, 7), (\frac{7}{2}, \frac{1}{4})\}$

Assignment: Sec 8.2, p. 452 #4-7, 18, 23, 24

exercise: Solve using The Elimination Method. Find the exact values.

a) $x^2 - 6y + 6 = 0$ and
 $3x^2 - 18y - 72 = 0$

b) $x^2 - 3y + 6 = 0$ and
 $-2x^2 + 6y - 12 = 0$

c) $2x^2 - 7x - y + 3 = 0$ and
 $-x^2 + 6x - y - 7 = 0$

Solutions: a) Hmm, what do you conclude? B) Hmm, what do you conclude?

c) $\{(1, -2), (\frac{10}{3}, \frac{17}{9})\}$

Do not print

exercise: Solve using The Elimination Method. Find the exact values.

a) $x^2 - 4x - y + 2 = 0$
 $3x + 2y - 11 = 0$

b) $x^2 + 2x - 2y + 6 = 0$
 $2x^2 + 4x - y + 3 = 0$

$x = -1$ and $y = 7$ or $x = \frac{7}{2}$ and $y = \frac{1}{4}$

$x = 0$ and $y = 3$ or $x = -2$ and $y = 3$

c) $x^2 - 2y - 6 = 0$
 $2x^2 - 4y + 3 = 0$

d) $-x^2 + 2y + 6 = 0$
 $2x^2 - 4y - 12 = 0$

no solution

infinitely many solutions

