

February 27, 2015

* Systems of Linear Equations

- only two Eq.
- only two variables

Systems

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Types of Outcomes or Results with Systems

- ① a single solution
- ② Infinite Solutions
- ③ No Solutions

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Methods of Solving

- ① Elimination/ Addition

$$\begin{cases} 10x + 8y = 4 \\ 6x - 8y = -12 \end{cases}$$

$$\begin{array}{r} 10x + 8y = 4 \\ 6x - 8y = -12 \\ \hline 16x \quad 0 = -8 \end{array}$$

$(-\frac{1}{2}, \frac{9}{8})$ *"y" is eliminated*

$$16x = -8$$

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

Now, substitute $x = -\frac{1}{2}$ into either equation to find "y".

- ② $6(-\frac{1}{2}) - 8y = -12$

$$\begin{array}{r} -3 - 8y = -12 \\ -8y = -9 \\ y = \frac{9}{8} \end{array}$$

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Check $(-\frac{1}{2}, \frac{9}{8})$

- ① $10x + 8y = 4$

$$10(-\frac{1}{2}) + 8(\frac{9}{8}) = 4$$

$$-5 + 9 = 4$$

$$4 = 4 \checkmark$$

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- ① $\begin{cases} 5x - 9y = 7 \\ -3x + 7y = -5 \end{cases}$

Steps in Using Elimination

- ① Determine which variable to eliminate and then eliminate.

$$\begin{cases} 5x - 9y = 7 \\ -15x + 21y = -15 \end{cases}$$

$$\begin{array}{r} 5x - 9y = 7 \\ -15x + 21y = -15 \\ \hline 0 \quad 8y = -4 \end{array}$$

$(\frac{1}{2}, -\frac{1}{2})$ $y = -\frac{1}{2}$

- ② Substitute result from ① into either original equation and solve.

$$5x - 9(-\frac{1}{2}) = 7$$

$$5x + \frac{9}{2} = 7$$

$$5x = 7 - \frac{9}{2}$$

$$5x = \frac{14}{2} - \frac{9}{2}$$

$$5x = \frac{5}{2}$$

$$x = \frac{5}{2} \cdot \frac{1}{5} = \frac{1}{2}$$

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Check $(\frac{1}{2}, -\frac{1}{2})$

- ② $-3x + 7y = -5$

$$-3(\frac{1}{2}) + 7(-\frac{1}{2}) = -5$$

$$-\frac{3}{2} - \frac{7}{2} = -5$$

$$\frac{-3-7}{2} = -5$$

$$-\frac{10}{2} = -5$$

$$-5 = -5 \checkmark$$

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