

Solving Linear Systems by Elimination

Solve the following system of equations:

$$\begin{array}{rcl} 17x + 23y & = & 35 \\ 26x - 23y & = & -121 \end{array}$$

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Solve the following system of equations:
(try adding them together)

$$\begin{array}{rcl} & 17x + 23y = 35 & \textcircled{1} \\ + & 26x - 23y = -121 & \textcircled{2} \\ \hline & 43x & = -86 \\ & 43 & 43 \end{array}$$

$$\boxed{x = -2}$$

Sub $x = -2$ into $\textcircled{1}$ or $\textcircled{2}$

$$17(-2) + 23y = 35$$

$$-34 + 23y = 35$$

$$23y = 35 + 34$$

$$\begin{array}{rcl} 23y & = & 69 \\ \hline 23 & & 23 \end{array}$$

$$\boxed{y = 3}$$

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Solving Linear Systems by Elimination

Sept 16/2011

Steps:

1. Write equations in the same form: $Ax + By = C$
 $y = mx + b$
2. Look for the coefficients of one of the variables to be the same (sign does not matter).
3. If necessary, multiply one or both equations by a whole number to achieve step 2.
4. a) Same coefficient, same sign: **subtract**
b) Same coefficient, opposite sign: **add**.
5. Solve the resulting equation.
6. Substitute to find the value of the other variable.

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Ex.1 Solve: $x + y = 60$ ① $x - y = 8$ ②

$$\begin{array}{r}
 x - y = 8 \\
 \hline
 \textcircled{1} + \textcircled{2} \quad \frac{2x}{2} = \frac{68}{2} \\
 \hline
 \boxed{x = 34}
 \end{array}$$

Sub $x = 34$ into ① or ②

$$\begin{array}{r}
 (34) + y = 60 \\
 y = 60 - 34 \\
 \hline
 \boxed{y = 26}
 \end{array}$$

 \therefore solution is $(34, 26)$

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Ex.2 Solve $5x + 2y = 5$ ① $3x - 4y = -23$ ②

$$\begin{array}{r} \textcircled{1} \times 2 : 10x + 4y = 10 \quad \textcircled{3} \\ 3x - 4y = -23 \\ \hline \end{array}$$

$$\begin{array}{r} \textcircled{3} + \textcircled{2} \quad \frac{13x}{13} = \frac{-13}{13} \\ \boxed{x = -1} \end{array}$$

Sub $x = -1$ into ①

$$5(-1) + 2y = 5$$

$$-5 + 2y = 5$$

$$2y = 10$$

$$\boxed{y = 5}$$

\therefore solution is $(-1, 5)$

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Ex.3 $\frac{x}{2} + \frac{y}{8} = 4$ ① $\frac{x}{3} - \frac{y}{2} = -2$ ②

* recommend getting rid of all fractions first

$$\textcircled{1} \times 8 : \frac{8x}{2} + \frac{8y}{8} = 32$$

$$\boxed{4x + y = 32} \quad \textcircled{3}$$

$$\textcircled{2} \times 6 : \frac{6x}{3} - \frac{6y}{2} = -12$$

$$\boxed{2x - 3y = -12} \quad \textcircled{4}$$

$$\textcircled{3} \times 3 : 12x + 3y = 96 \quad \textcircled{5}$$

$$\textcircled{4} : 2x - 3y = -12$$

$$\textcircled{5} + \textcircled{4} \quad 14x = 84$$

\therefore solve

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Assigned Work:

p.54 # 1, 4, 6odd, 11odd, 20*

ace... ace...

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4(b) $3x - 7y = 11$ ① $\times 8$
 $5x + 8y = 9$ ② $\times 7$

$$24x - 56y = 88$$

$$35x + 56y = 63$$

$$\overline{7} + \overline{8}$$

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$$\begin{array}{rcl} 11(a) & 5x - 12y = 1 & \textcircled{1} \times 9 \\ & 13x + 9y = 16 & \textcircled{2} \times 12 \end{array}$$

$$\begin{array}{rcl} \textcircled{1} \times 9 & : & 45x - 108y = 9 \\ \textcircled{2} \times 12 & : & 156x + 108y = 192 \end{array}$$

$$+ \quad 201x \quad = 201$$

$$\boxed{x = 1}$$

Sub $x = 1$ into $\textcircled{2}$

$$13(1) + 9y = 16$$

$$9y = 3$$

$$y = \frac{3}{9}$$

$$\boxed{y = \frac{1}{3}}$$

$$(1, \frac{1}{3})$$

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2. substitution

$$-5x + 3y = -5 \quad \textcircled{1}$$

$$-2x + y = -5 \quad \textcircled{2}$$

$$\textcircled{2}: y = 2x - 5 \quad \textcircled{3}$$

Sub $\textcircled{3}$ into $\textcircled{1}$

$$-5x + 3(2x - 5) = -5$$

$$-5x + 6x - 15 = -5$$

$$\boxed{x = 10}$$

$$y = 2(10) - 5$$

$$\boxed{y = 15}$$

$$(10, 15)$$

3. elimination

$$9x - 2y = 5 \quad \textcircled{1}$$

$$4x + 2y = 8 \quad \textcircled{2}$$

$$\begin{array}{rcl} \textcircled{1} + \textcircled{2} & : & 13x = 13 \\ & : & \frac{13}{13} = \frac{13}{13} \end{array}$$

$$\boxed{x = 1}$$

Sub $x = 1$ into $\textcircled{2}$

$$4(1) + 2y = 8$$

$$2y = 4$$

$$\boxed{y = 2}$$

$$(1, 2)$$

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