Feb 24

MPM2D

Solving Systems of Equations Review

* Quiz on Thurs Feb

1. When solving a system of equations you are finding POI (Point of Intersection).

2. Three methods used to solve a system of equations are:
   1. Graphing
   2. Substitution
   3. Elimination

3. (3) Two lines intersect each other only once : slopes are different.

3. List the three different ways lines can intersect and describe how you can tell, ***without solving***, which situation exists.

3.(1) Two line parallel : same slope (= m)

3.(2) Two lives overlap each other : same m

" b

4. Solve the following systems by graphing:

a) $3x - 4y = 12$ — (c)
   $6x + 8y = -24$ — (d)

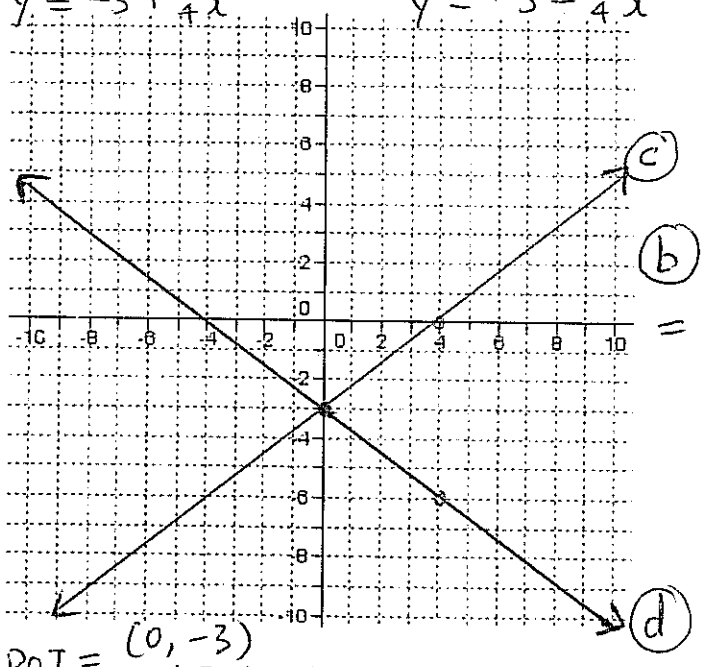
b) $2x + 5y = 10$ — (e)
   $3x + y = 6$ — (f)

(c) $-4y = 12 - 3x$
$y = -3 + \frac{3}{4}x$

(d) $8y = -24 - 6x$
$y = -3 - \frac{3}{4}x$

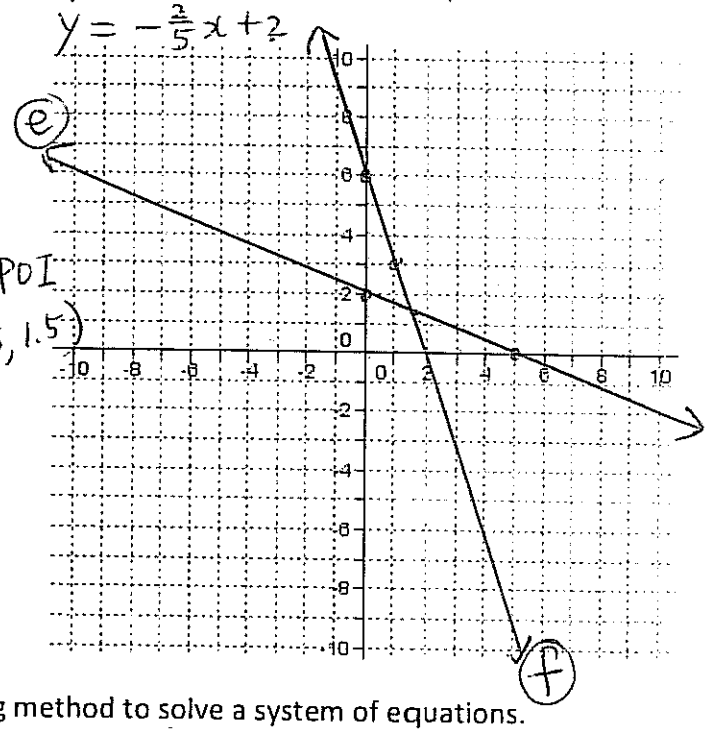
(e) $5y = 10 - 2x$
$y = -\frac{2}{5}x + 2$

(f) $y = 6 - 3x$



(a) ∴ POI = (0, −3)

(b) ∴ POI = (1.5, 1.5)



c) Explain the problem with using the graphing method to solve a system of equations.

We can not always get an accurate answer. We have to estimate the answer.

5. Solve the following systems using the method of substitution.

a) $2x + 3y - 9 = 0$
   $x - y - 2 = 0$

b) $x + 5y = 11$
   $4x - y = 2$

c) $x - 7 = y$
   $\frac{1}{4}x - 1 = y$

6. Solve each of the following systems using the elimination method.

a) $x + y - 5 = 0$
   $x - y - 3 = 0$

b) $x - 2y - 10 = 0$
   $3x + 5y + 3 = 0$

7. In question 6b), which variable did you eliminate? Solve the system again, this time eliminate the **OTHER** variable. How does your method have to change? Is one way of doing this question easier than the other? Why?

8. IN YOUR OWN WORDS, explain:
   - how the elimination method works
   - when to add and when to subtract
   - when to multiply equations and how to choose which numbers to multiply by

9. Solve each of the following system of equations using the elimination method. Some of these systems have twists to them. Working through them will help you to develop an even deeper understanding of the elimination method.

a) $\begin{aligned} 4x-3y-17&=0 \\ 3x+2y&=0 \end{aligned}$

b) $\begin{aligned} 8x&=24-3y \\ 10-4x&=y \end{aligned}$

c) $\begin{aligned} 0.4x+0.3y&=5 \\ 10x+5y&=100 \end{aligned}$

d) $\begin{aligned} \frac{x}{4}+\frac{y}{5}&=5 \\ x+y&=22 \end{aligned}$

10. Solve the following systems using the method of your choice.

a) $\begin{aligned} 2(x-4)+y&=6 \\ 3x-2(y-3)&=13 \end{aligned}$

b) $\begin{aligned} \frac{4x}{3}-\frac{y}{4}&=6 \\ \frac{5x}{6}+y&=13 \end{aligned}$

c) $\begin{aligned} \frac{x-5}{3}+\frac{y+1}{2}&=1 \\ \frac{x-1}{5}+\frac{y+2}{3}&=2 \end{aligned}$

11. Compare the methods of graphing, substitution and elimination. Is there one method that is better than the others? In what situation would you choose to use one method over another?

Answer: It depends on the situation. Sometimes it is easier to use elimination if the coefficients of x term (or y term) are the same. Sometimes substitution is easier, if one equation is already arranged for one variable.

ANSWERS

4a) $(0, -3)$	b) $(\frac{20}{13}, \frac{18}{13})$		
5a) $(3, 1)$	b) $(1, 2)$	c) $(8, 1)$	
6a) $(4, 1)$	b) $(4, -3)$		
7. $(4, -3)$			
9a) $(2, -3)$	b) $(\frac{3}{2}, 4)$	c) $(5, 10)$	d) $(12, 10)$
10a) $(5, 4)$	b) $(6, 8)$	c) $(-4, 7)$	

Feb 24 Class note solution

#5 a)

$2x+3y-9=0$ ⓐ

$x-y-2=0$ ⓑ

$x=y+2$

Sub $x=y+2$ into ⓐ

ⓐ $2(y+2)+3y-9=0$

$2y+4+3y-9=0$

$5y-5=0$

$5y=5$

$\div 5 \quad \div 5$

$\therefore y=1$

sub $y=1$ into ⓑ

ⓑ $x-(1)-2=0$

$x-3=0$

$x=3$

$\therefore$ POI $=(3,1)$

5b)

$x+5y=11 \rightarrow$ ⓐ

$4x-y=2 \rightarrow$ ⓑ

Rearrange ⓐ $\rightarrow x=11-5y$

sub $x=11-5y \rightarrow$ ⓑ

ⓑ $4(11-5y)-y=2$

$44-20y-y=2$

$44-21y=2$

$-21y=2-44$

$-21y=-42$

$\div -21 \quad \div -21$

$y=2$

sub $y=2$ into ⓐ

ⓐ $x+5(2)=11$

$x+10=11$

$x=11-10=1$

$\therefore$ POI $(1,2)$

6a)

$x+y-5=0$ — ⓐ

$x-y-3=0$ — ⓑ

ⓐ + ⓑ $2x+0-8=0$

$2x=8$

$\div 2 \quad \div 2$

$x=4$

sub $x=4$ into ⓐ

ⓐ $4+y-5=0$

$y-1=0$

$y=1$

$\therefore$ POI $=(4,1)$

5c) $x - 7 = y$ — ⓐ

$\frac{1}{4}x - 1 = y$ — ⓑ

Sub ⓐ into ⓑ

ⓑ $\frac{1}{4}x - 1 = x - 7$

$\frac{1}{4}x - \frac{x \times 4}{1 \times 4} = -7 + 1$

$\frac{x - 4x}{4} = -6$

$\frac{-3x}{4} = -6$

$\times -\frac{4}{3} \qquad \times -\frac{4}{3}$

$x = \frac{24}{3} = 8$

sub $x = 8$ into ⓐ

ⓐ $8 - 7 = y$

$1 = y$

$\therefore$ POI $= (8, 1)$

6b) $x - 2y - 10 = 0$ — Ⓐ

$3x + 5y + 3 = 0$ — Ⓑ

$3 \times$ Ⓐ $\rightarrow$ $3x - 6y - 30 = 0$

Ⓑ $-$ $3x + 5y + 3 = 0$

3Ⓐ $-$ Ⓑ $\quad 0 - 11y - 33 = 0$

$-11y = 33$

$\div -11 \qquad \div -11$

$y = -3$

sub $y = -3$ into Ⓐ

Ⓐ $x - 2 \cdot (-3) - 10 = 0$

$x + 6 - 10 = 0$

$x - 4 = 0$

$\therefore x = 4$

$\therefore$ POI $= (4, -3)$

7. This method is easier because I just had to multiply by 3 to equation Ⓐ, whereas the other method, you will have to multiply both equations.

8. Elimination method eliminates one variable from one of the two equations, then you use that solution to solve the second equation.

Feb 24 Class note (2)

8. • We add two equations if the coefficient of x (or y) have different signs.

• We multiply one of the equations, if the coefficient of x (or y) are different number. We choose a number which can change one of the coefficient to same number as the other coefficient.

9. a) $4x - 3y - 17 = 0 \rightarrow$ Ⓐ

$3x + 2y = 0 \rightarrow$ Ⓑ

Ⓐ×2 : $8x - 6y - 34 = 0$

Ⓑ×3 : $+\ 9x + 6y = 0$

2Ⓐ + 3Ⓑ $17x + 0 - 34 = 0$

$17x = 34$

$x = 2$

sub into Ⓑ

$3(2) + 2y = 0$

$6 + 2y = 0$

$2y = -6$

$y = -3$

$\therefore$ POI $= (2, -3)$

c) $0.4x + 0.3y = 5$ — Ⓐ

$10x + 5y = 100$ — Ⓑ

Ⓐ×10 $4x + 3y = 50$

Ⓐ×10×5 $20x + 15y = 250$

Ⓑ×3 $-\ 30x + 15y = 300$

$-10x + 0 = -50$

$-10x = -50$

$x = 5$

sub into Ⓑ

$10 \times 5 + 5y = 100$

$5y = 50$

$y = 10$

$\therefore$ POI $= (5, 10)$

d) $\frac{x}{4} + \frac{y}{5} = 5$ — Ⓐ

$x + y = 22$ — Ⓑ

Ⓐ×20 : $20\left(\frac{x}{4} + \frac{y}{5}\right) = 20 \times 5$

$5x + 4y = 100$

20×Ⓐ : $5x + 4y = 100$

4×Ⓑ : $-\ 4x + 4y = 88$

$\therefore x = 12$

Sub into Ⓑ $\rightarrow 12 + y = 22$

$\therefore y = 10$

$\therefore$ POI $= (12, 10)$

10c) $\frac{x-5}{3} + \frac{y+1}{2} = 1$ Ⓐ

$\frac{x-1}{5} + \frac{y+2}{3} = 2$ Ⓑ

Ⓐ $\times 6$: $6\left(\frac{x-5}{3} + \frac{y+1}{2}\right) = 6 \times 1$

$2(x-5) + 3(y+1) = 6$

$2x - 10 + 3y + 3 = 6$

$2x + 3y = 6 + 7$

$2x + 3y = 13 \longrightarrow$ Ⓐ'

Ⓑ $\times 15$: $15\left(\frac{x-1}{5}\right) + 15\left(\frac{y+2}{3}\right) = 2 \times 15$

$3(x-1) + 5(y+2) = 30$

$3x - 3 + 5y + 10 = 30$

$3x + 5y = 30 - 7$

$3x + 5y = 23 \longrightarrow$ Ⓑ'

Ⓐ' $\times 3$ $\quad 6x + 9y = 39$

Ⓑ' $\times 2$ $\quad -\ 6x + 10y = 46$

$0 + (-y) = -7$

$\therefore y = 7$

Sub $y = 7$ into Ⓐ' $\quad 2x + 3(7) = 13$

$2x + 21 = 13$

$2x = -8$

$\therefore$ POI $= (-4, 7)$ $\quad \therefore x = -4$