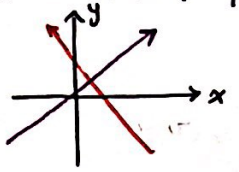
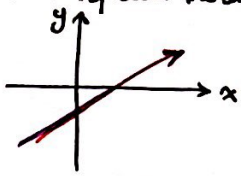
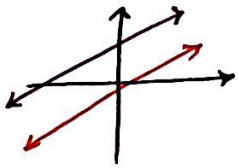
Note: (I) exactly one Solution (independent)



(II) Both equations represent the Same line (infinite Solutions) ✓



No intersect (no Sol)



SEW Math 090

Worksheet 3.1: Systems of Linear Equations by Graphing

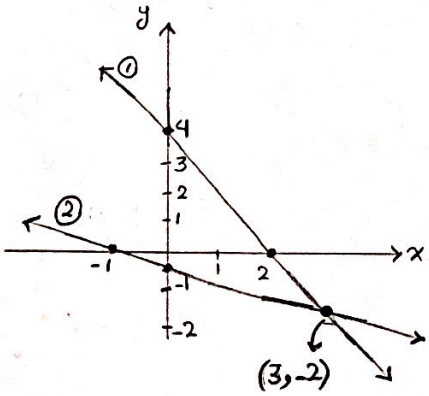
Summer 2016

Solve the systems of equations by graphing. Indicate whether each system has a unique solution, no solution, or an infinite number of solutions.

1. $2x + y = 4$
   $x + 2y = -1$

① $y = -2x + 4$

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

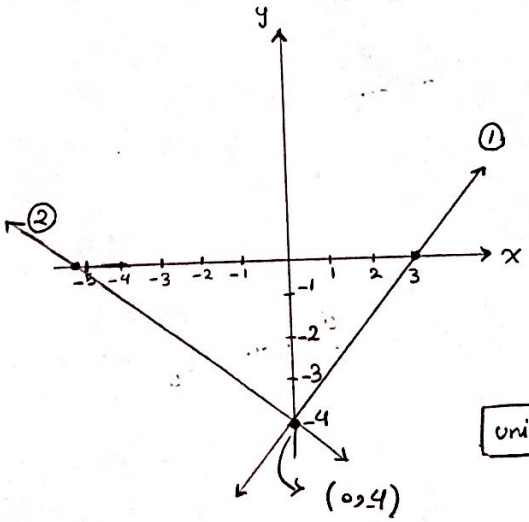


unique solution

2. $4x - 3y = 12$
   $3x + 4y = -16$

① $3y = 4x - 12$
$y = \frac{4}{3}x - 4$

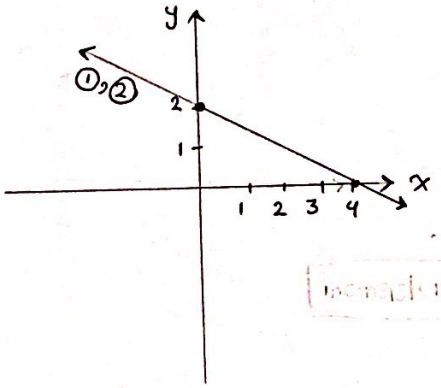
② $4y = -3x - 16$
$y = -\frac{3}{4}x - 4$



unique solution

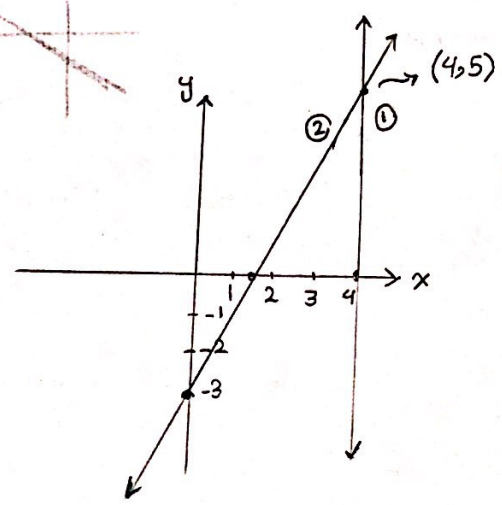
3. $4x = 16 - 8y$
① $y = -\frac{1}{2}x + 2$

$8y = -4x + 16$
② $y = -\frac{1}{2}x + 2$



infinite # of Solutions.

4. $x = 4$ ①
$y = 2x - 3$ ②

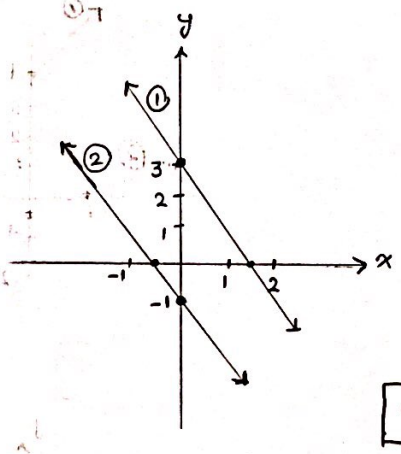


unique Solution

5. $y = -2x + 3$
$-2x = y + 1$

① $y = -2x + 3$

② $y = -2x - 1$



No Solution!

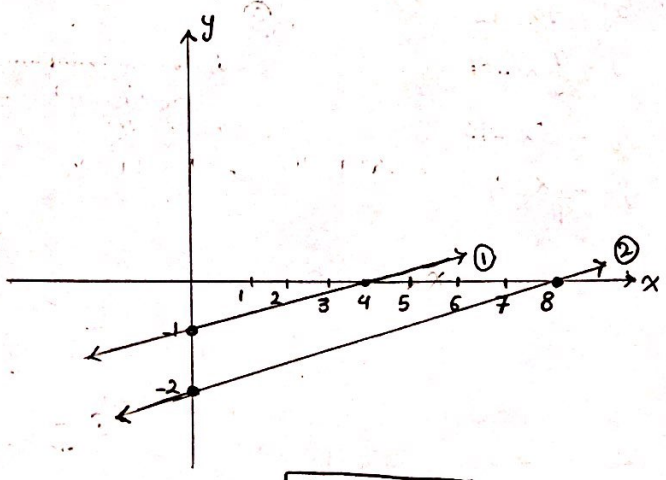
6. $x = 4y + 4$
$-2x + 8y = -16$

$4y = x - 4$

① $y = \frac{1}{4}x - 1$

$8y = 2x - 16$

② $y = \frac{1}{4}x - 2$



No Solution!

✓

SEW Math 090 **Worksheet 3.2: Systems of Linear Equations** Summer 2016

Solve the systems of equations by substitution or addition. Give the unique solution, or indicate whether the system is inconsistant, or is dependent.

1. $2x - 4y = 8$
   $y = 2x + 1$

$2x - 4y = 8$
$x-1\ (2x - y = -1) \Rightarrow -2x + y = 1$ +

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

$2x + 1 = -3 \rightarrow 2x = -4 \Rightarrow x = \frac{-4}{2} = -2$

$x = -2$
$y = -3$

2. $8x + 6y = -8$
   $x = 6y - 10$

$8x + 6y = -8$
$-1 \times (-x + 6y = 10) \Rightarrow x - 6y = -10$ +

$9x = -18 \Rightarrow x = -\frac{18}{9} = -2$

$8(-2) + 6y = -8 \Rightarrow 6y = -8 + 16$

$6y = 8 \rightarrow y = \frac{8}{6} = \frac{4}{3}$

$x = -2$
$y = 4/3$

3. $2x + 5y = 9$
   $4x - 7y = -16$

$x-2\ (2x + 5y = 9)$
$4x - 7y = -16 \Rightarrow -4x - 10y = -18$

$4x - 7y = -16$

$-17y = -34 \Rightarrow y = \frac{-34}{-17} = 2$

$2x + 5(2) = 9 \rightarrow 2x = 9 - 10$

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

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

4. $4x - 6y = 5$
$-2x(2x - 3y = 7)$ $\Longrightarrow$ $4x = 6y + 5 \div 4$ $\Rightarrow$ $x = \frac{3}{2}y + \frac{5}{4}$
$2x = 3y + 7 \div 2$ $x = \frac{3}{2}y + \frac{7}{2}$

$4x - 6y = 5$
$-4x + 6y = -14$ +
$0 = -9$ ✗

The slope of the two equations are the same $(= \frac{3}{2})$,
But the y-intercept are different!
So, the lines are parallel and System has no solution.
this is an **inconsistent system.**

5. $3x + 6y = 7$
$2x + 4y = 5$

$x-2(3x + 6y = 7)$
$x3(2x + 4y = 5)$ $\Rightarrow$ $-6x - 12y = -14$
$6x + 12y = 15$

$0 = 1$ ✗

$\Rightarrow$ $3x = -6y + 6 \div 3$ $x = -2y + 2$
$2x = -4y + 5 \div 2$ $x = -2y + \frac{5}{2}$

like the Problem above, System is **inconsistent.**

6. $5x - 3y = 18$
$-3x + 5y = 18$

$x3(5x - 3y = 18)$
$x5(-3x + 5y = 18)$

$15x - 9y = 54$
$-15x + 25y = 90$ +
$16y = 144$

$y = \frac{144}{16} = 9$

$5x - 3(9) = 18$
$5x = 18 + 27$
$5x = 45 \rightarrow x = \frac{45}{5} = 9$

$x = 9$
$y = 9$

SEW Math 090 **Worksheet 3.3: Applications of Linear Equations** Summer 2016

1. A school is putting on a production of *Chicago*. There were 186 tickets sold for a particular night, some for \$16 (nonstudent price) and others for \$12 (student price). If the receipts totaled \$2640, how many of each type of ticket were sold?

$$(-16)\begin{cases} NS + S = 186 \\ 16NS + 12S = 2640 \end{cases} \Rightarrow \begin{cases} -16NS - 16S = -2976 \\ 16NS + 12S = 2640 \end{cases} +$$

$$-4S = -336$$

$$S = \frac{-336}{-4} = 84$$

$$NS = 186 - 84 = 102$$

2. John and Ariana bought school supplies. John spent \$10.65 on 4 notebooks and 5 pens. Ariana spent \$7.50 on 3 notebooks and 3 pens. What is the cost of 1 notebook and what is the cost of 1 pen?

$$\begin{matrix} \text{John:} \\ \text{Ariana:} \end{matrix} \begin{cases} 4N + 5P = 10.64 \ (\times 3) \\ 3N + 3P = 7.50 \ (\times -4) \end{cases} \Rightarrow \begin{cases} 12N + 15P = 31.92 \\ -12N - 12P = -30 \end{cases} +$$

$$3P = 1.92 \Rightarrow P = \frac{1.92}{3} = 0.64$$

$$4N + 5P = 10.64 \xrightarrow{P=0.64} 4N = 10.64 - 5(0.64) = 10.64 - 3.2$$

$$4N = 7.44 \Rightarrow N = 1.86$$

3. How much fertilizer containing 8% nitrogen should be mixed with a fertilizer containing 12% nitrogen to get 8 L of a fertilizer containing 11% nitrogen?

$f_1 = 8\%$

$f_2 = 12\%$

$$\times -\frac{8}{100}\begin{cases} f_1 + f_2 = 8 \\ \frac{8}{100} f_1 + \frac{12}{100} f_2 = \frac{11}{100} \times 8 \end{cases} \Rightarrow \begin{cases} -\frac{8}{100} f_1 - \frac{8}{100} f_2 = -\frac{64}{100} \\ \frac{8}{100} f_1 + \frac{12}{100} f_2 = \frac{88}{100} \end{cases} +$$

$$\Rightarrow \frac{4}{100} f_2 = \frac{24}{100} \Rightarrow f_2 = 6L$$

$$f_1 = 8 - 6 = 2L$$

4. How much 30% acid solution (S) should be added to a 10% acid solution (A) to make 100 mL of a 12% acid solution?

$$\times -\frac{30}{100}\begin{cases} S + A = 100 \\ \frac{30}{100}S + \frac{10}{100}A = \frac{12}{100}\times 100 \end{cases} \Rightarrow \begin{cases} -\frac{30}{100}S - \frac{30}{100}A = -30 \\ \frac{30}{100}S + \frac{10}{100}A = 12 \end{cases} +$$

$$-\frac{20}{100}A = -18$$

$$A = \frac{18}{\frac{2}{10}} = 90 \text{ mL (amt of 10\% Solution needed}$$

$$S = 100 - 90 = 10 \text{ mL (amt of 30\% Solution needed}$$

5. It takes a motor boat 2 hr to travel 16 mi downstream with the current and 4 hr to return against the current. Find the speed of the boat in still water and the speed of the current.

distance = rate × time → $d = rt$

downstream with current: $16 = (b+w)\cdot 2$

downstream against current: $16 = (b-w)\cdot 4$

$$\Rightarrow \begin{cases} b+w = 8 \\ b-w = 4 \end{cases} +$$

$$2b = 12 \rightarrow \boxed{b = 6}$$

$$\boxed{w = 2}$$

6. A plane flies rom Atlanta to Los Angeles against the wind in 5 hr. The return trip back to Atlanta with the wind takes only 4 hr. If the distance between Atlanta and Los Angeles is 3200 km, find the speed of the plane in still air and the speed of the wind.

$d = rt$

against wind: $3200 = (a-w)\times 5 \rightarrow a - w = 640$

with wind: $3200 = (a+w)\times 4 \rightarrow a + w = 800$ +

$$2a = 1440 \rightarrow \boxed{a = 720}$$

$$w = 800 - 720 = \boxed{80}$$