Systems of Linear Equations & Graphing

System of Linear Equations: 2 or more linear equations involving the same variables (eg x and y.)

The solution to a linear system can be shown in 3 ways:
① point of intersection on a graph.

② an ordered pair that satisfies both equations

③ pair of values that occur in the table of values of both equations.

Eg $y = 3x$ $y = x + 2$.

x	y
0	0
1	3
2	6
3	9

x	y
0	2
1	3
2	4
3	5

$y = 3x$

$y = x + 2$.

Solution $(1, 3)$
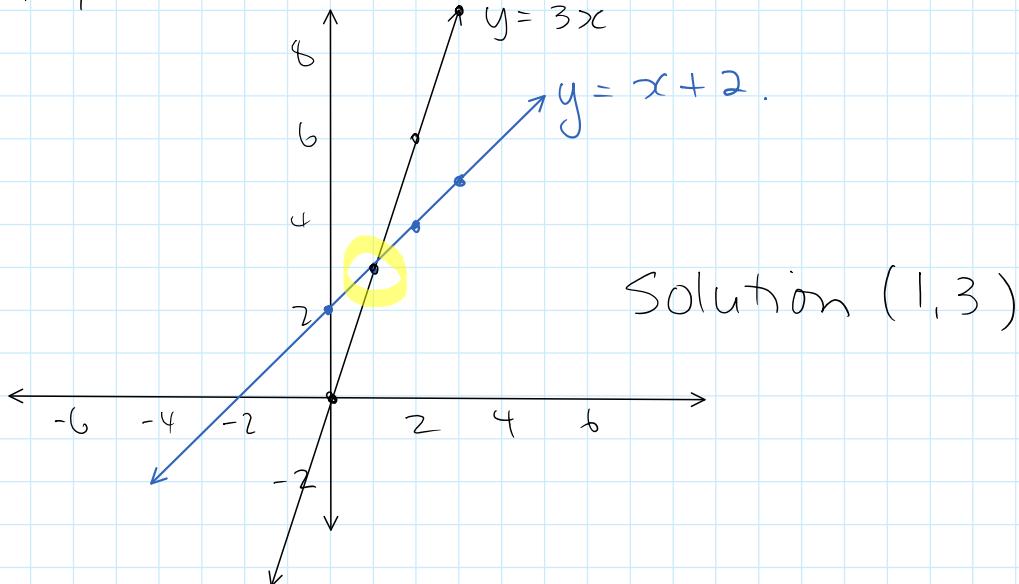
Eg Mary has 6 presents wrapped + wraps 3 more per day. Cheryl has 8 presents wrapped + wraps 2 more per day.

On what day will they have the same number of presents wrapped?
P = total number of presents wrapped
d = the number of days.

Mary

d	P
0	6
1	9
2	12
3	15
4	18
5	21

+1 (0→1) +3
(1→2) +3

$y = mx + b$.
$P = 3d + 6$

Cheryl.

d	P
0	8
1	10
2	12
3	14
4	16
5	18

+1 (0→1) +2
+1 (2) +2.

$P = 2d + 8$

presents wrapped (P)

Mary
• Cheryl

solution (2, 12).

P axis values: 22, 20, 18, 16, 14, 12, 10, 8, 6, 4, 2

d axis: 1 2 3 4 5 6 7

days (d)
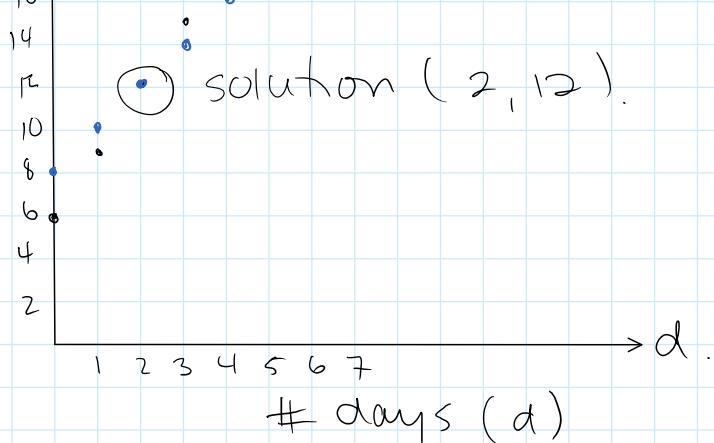
Try: "Your Turn"   pg 419

Davidee   Let E = Earnings Carmen
           h = hours.

h	E
1	50
2	60
3	70
4	80
5	90
6	100

h	E
1	58
2	66
3	74
4	82
5	90
6	98

Earnings ($)

E axis values: 110, 100, 90, 80, 70, 60, 50, 40, 30, 70

solution (5, 90)

40
30
20
10

1 2 3 4 5 6 7 8 9 10 → h.
hours
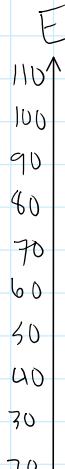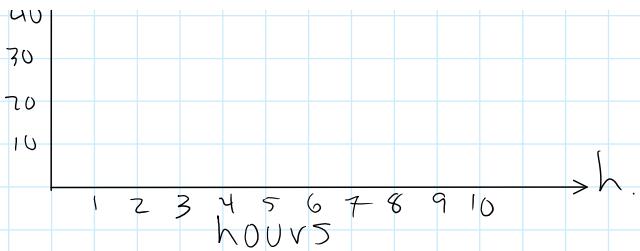
Solve $2x+y=5$ and $x-y=1$ <u>graphically</u>
<u>Verify your solution.</u>

① $2x+y=5$
   $y=\dfrac{-2x}{1}+5$

② $x-y=1$
   $\dfrac{-y}{-1}=\dfrac{-x}{-1}+\dfrac{1}{-1}$
   $y=x-1$

<u>Verify</u>:
① $2x+y=5$
   $2(2)+1 \overset{?}{=} 5$
   $4+1=5$ ✓

② $x-y=1$
   $2-1=1$ ✓
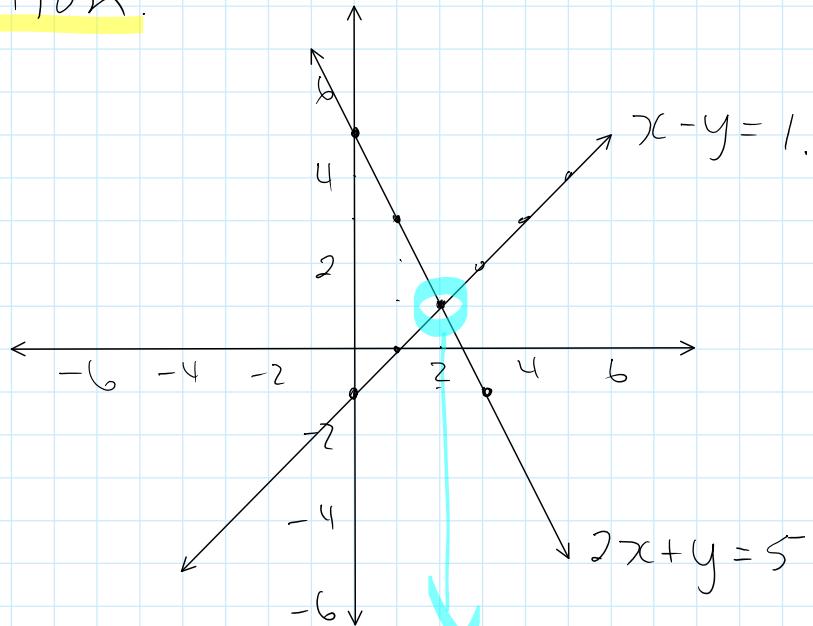
solution: $(2,1)$
$\qquad\quad x,y$

Try: Find a solution for $x-3y=9$ and
$2x+y=4$ <u>graphically</u>. Verify solution

① $x-3y=9$
   $\dfrac{-3y}{-3}=\dfrac{-x}{-3}+\dfrac{9}{-3}$
   $y=\dfrac{1}{3}x-3$

② $2x+y=4$
   $y=-2x+4$

Verify:
   $3-3(-2)\overset{?}{=}9$
   $3+6=9$ ✓

$\rightarrow (3,-2)$
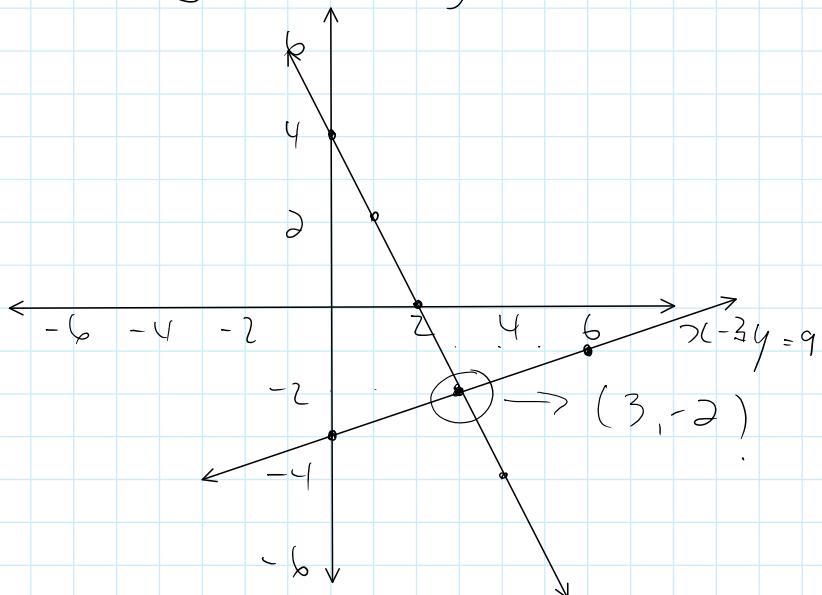
$3 - 3(-2) \overset{?}{=} 9$
$3 + 6 = 9 \checkmark$
$2(3) + -2 \overset{?}{=} 4$
$6 - 2 = 4 \checkmark$

$-6 \downarrow$
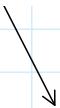
Eg Verify that $(2,5)$ is a solution to the system $3x - y = 1$ and $x + 4y = 32$.

$3(2) - 5$ $\qquad$ $2 + 4(5)$
$6 - 5 = 1 \checkmark$ $\qquad$ $2 + 20 \neq 32$.

$(2,5)$ is $\underline{not}$ a solution to the system!

Pg 426-31 # 3-11, 14, 17.