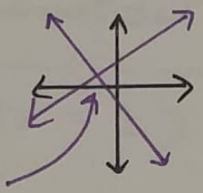
MA40

SECTION 5.1 – SYSTEMS OF LINEAR EQUATIONS

* 2 OR MORE EQUATIONS WITH THE SAME VARIABLE ARE REFERRED TO AS A SYSTEM OF EQUATIONS.

* A SYSTEM OF 2 EQUATIONS WILL HAVE:

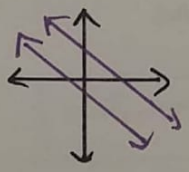
(1) EXACTLY 1 SOLUTION:



INTERSECTION IS SOLUTION.

(2) AN INFINITE # OF SOLUTIONS: TWO LINES "ON TOP" OF EACH OTHER. (HAVE SAME SLOPE + Y-INT)

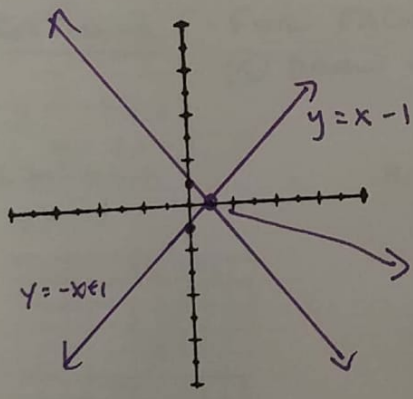
(3) NO SOLUTIONS:



PARALLEL LINES (NEVER CROSS) SAME SLOPE BUT DIFFERENT Y-INTERCEPT.

PART 1: SOLVING GRAPHICALLY (CALCULATOR ACTIVE)

EXAMPLE 1: SOLVE THE SYSTEM: $y = x - 1$ $m = 1$ $b = -1$; $y = -x + 1$ GRAPHICALLY. $m = -1$ $b = 1$



SKETCH GRAPHS + LABEL SOLUTION.

SOLUTION (1, 0)

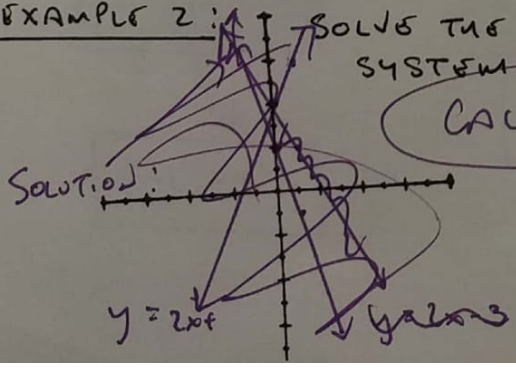
EXAMPLE 2: SOLVE THE SYSTEM $y = 2x - 3$ $m = 2$ $b = -3$; $2x + y = 4$ GRAPHICALLY.

$y = -2x + 4$

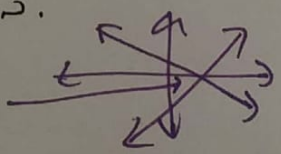
$m = -2$ $b = 4$

CALCULATOR

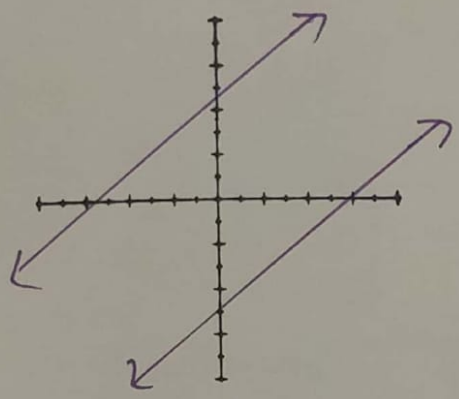
SKETCH GRAPHS + LABEL SOLUTION.



$(1.75, 0.5)$



EXAMPLE 3: SOLVE THE SYSTEM $y = x + 4$, $y = x - 1$ GRAPHICALLY.



SKETCH GRAPHS + LABEL SOLUTION.

NO SOLUTION

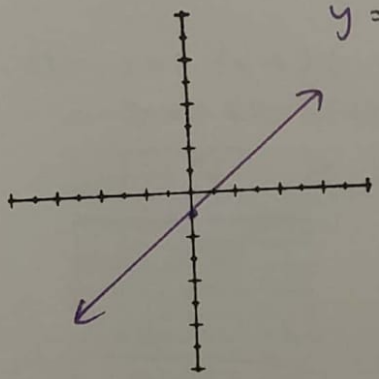
(SLOPE = 1)

EXAMPLE 4: SOLVE THE SYSTEM $y = x - 1$, $2x - 2y = 2$ GRAPHICALLY.

$-2y = -2x + 2$

$y = x - 1$

SKETCH GRAPHS + LABEL SOLUTION.



INFINITE SOLUTIONS

(SAME LINE)

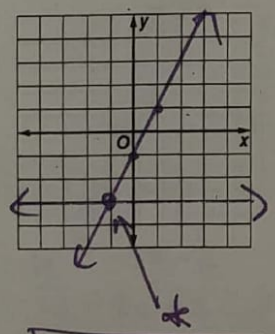
APPLICATIONS: FOR EACH SYSTEM OF EQUATIONS: (A) DRAW GRAPHS, (B) NAME AND LABEL THE SOLUTION.

$-y = -2x + 1$

$y = 2x - 1$

5. $2x - y = 1$

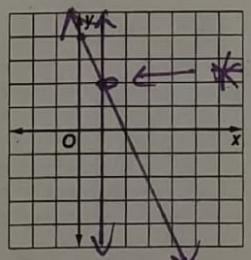
$y = -3$



(−1, −3)

6. $x = 1$ (*)

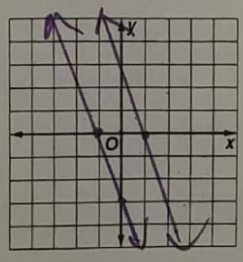
$2x + y = 4$ $y = -2x + 4$



(1, 2)

7. $3x + y = -3$ $y = -3x - 3$

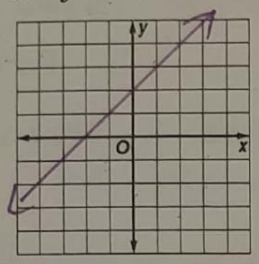
$3x + y = 3$ $y = -3x + 3$



NO SOLUTION

$-y = -x - 2$
$y = x + 2$

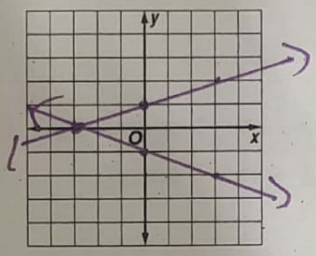
8. $y = x + 2$
$x - y = -2$



INFINITE SOLUTIONS

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

9. $x + 3y = -3$
$x - 3y = -3$

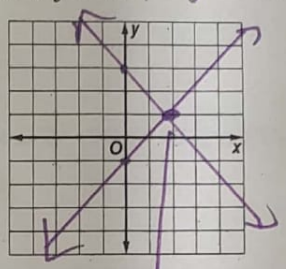


$-3y = -x - 3$
$y = \frac{1}{3}x + 1$

(-3, 0)

$y = x - 1$
$y = -x + 3$

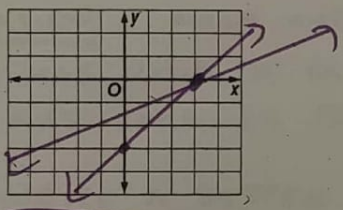
10. $y - x = -1$
$x + y = 3$



(2, 1)

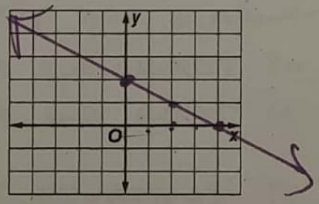
$\left(\frac{A}{B} = \frac{-1}{2}\right)$

11. $x - y = 3$ (0, -3) (3, 0)
$x - 2y = 3$ $(0, -\frac{3}{2})$ (3, 0



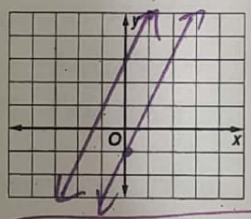
(3, 0)

12. $x + 2y = 4$ (0, 2) (4, 0)
$y = -\frac{1}{2}x + 2$



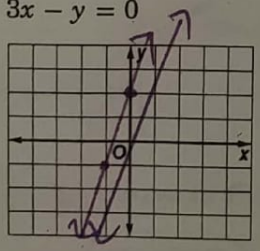
INFINITE SOLUTIONS

13. $y = 2x + 3$
$3y = 6x - 6$ $y = 2x - 2$



NO SOLUTION

5. $3x - y = -2$
$3x - y = 0$

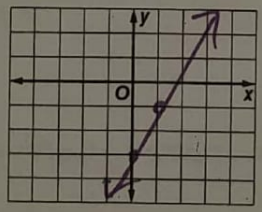


$-y = -3x - 2$
$y = 3x + 2$

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

NO SOLUTION

6. $y = 2x - 3$
$4x = 2y + 6$



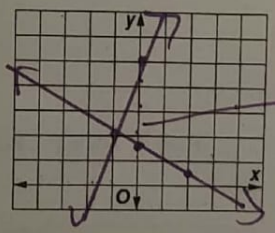
$2y = 4x - 6$
$y = 2x - 3$

(SAME LINE)

INFINITE SOLUTIONS

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

$2y = -x + 3$
$y = -\frac{1}{2}x + \frac{3}{2}$



(-1, 2)

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

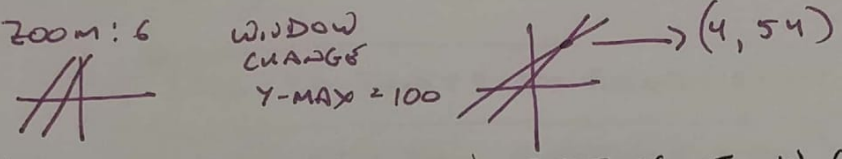
EXAMPLE 5. JOE AND JOSH EACH WANT TO BUY A VIDEO GAME. JOE HAS $14 AND SAVES $10 PER WEEK. JOSH HAS $26 AND SAVES $7 PER WEEK. IN HOW MANY WEEKS WILL THEY HAVE THE SAME AMOUNT?

(A) WRITE A SYSTEM OF EQUATIONS TO REPRESENT THE SITUATION.

JOE: $y = 14 + 10x$ JOSH: $y = 26 + 7x$

(B) GRAPH THE SYSTEM USING AN APPROPRIATE WINDOW. SKETCH YOUR GRAPH BELOW.

ZOOM: 6 WINDOW CHANGE Y-MAX = 100



(C) DETERMINE THE SOLUTION, STATING IT IN CONTEXT.

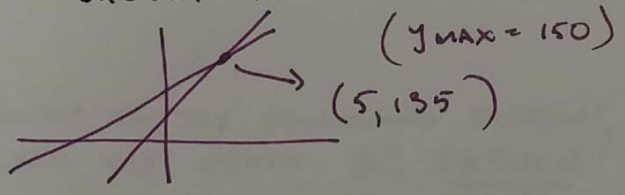
(4, 54) IN 4 WKS, BOTH WILL HAVE $54

APPLICATION. MARY AND SUE ARE READING A GRAPHIC NOVEL. MARY HAS READ 35 PAGES AND READS 20 PAGES PER DAY. SUE HAS READ 85 PAGES AND READS 10 PAGES PER DAY.

(A) WRITE A SYSTEM OF EQUATIONS TO REPRESENT THE SITUATION:

MARY: $y = 35 + 20x$
SUE: $y = 85 + 10x$
} (DISCUSS WINDOW)

(B) GRAPH THE SYSTEM USING AN APPROPRIATE WINDOW. SKETCH YOUR GRAPH BELOW.



(C) DETERMINE THE SOLUTION, STATING IT IN CONTEXT.

(5, 135)

IN 5 DAYS, BOTH WILL HAVE READ 135 PAGES

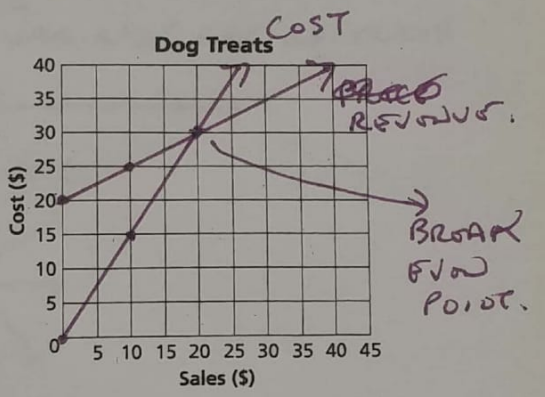
PRACTICE. COMPLETE THESE PROBLEMS WITHOUT A CALCULATOR.

(1)

BUSINESS Nick plans to start a home-based business producing and selling gourmet dog treats. He figures it will cost \$20 in operating costs per week plus \$0.50 to produce each treat. He plans to sell each treat for \$1.50.

a. Graph the system of equations $y = 0.5x + 20$ and $y = 1.5x$ to represent the situation. $m = \frac{5}{10}$ $m = \frac{15}{10}$

b. How many treats does Nick need to sell per week to break even?



(20, 30)

SELL 20 TREATS TO BREAK EVEN

(COST = 30, REVENUE = 30)

(2)

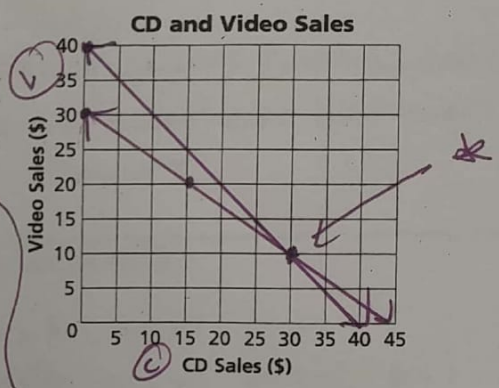
C = CD's
V = VID's

SALES A used book store also started selling used CDs and videos. In the first week, the store sold 40 used CDs and videos, at \$4.00 per CD and \$6.00 per video. The sales for both CDs and videos totaled \$180.00

a. Write a system of equations to represent the situation. $C + V = 40$, $4C + 6V = 180$

b. Graph the system of equations.

c. How many CDs and videos did the store sell in the first week?



(30, 10)

30 CDS & 10 VIDEOS

$V = -C + 40$
$6V = -4C + 180$
$V = -\frac{2}{3}C + 30$

(3) WHICH OF THE FOLLOWING SYSTEMS OF EQUATIONS DOES NOT BELONG WITH THE OTHER 3? EXPLAIN!

$4x - y = 5$ $-2x + y = -1$	$-x + 4y = 8$ $3x - 6y = 6$	$4x + 2y = 14$ $12x + 6y = 18$	$3x - 2y = 1$ $2x + 3y = 18$
$-y = -4x + 5$ $(y = 4x - 5)$ $(y = 2x - 1)$	$4y = x + 8$ $(y = \frac{1}{4}x + 2)$ $-6y = -3x + 6$ $(y = \frac{1}{2}x + 1)$	$2y = -4x + 14$ $(y = -2x + 7)$ $12x + 6y = 18$ $6y = -12x + 18$ $(y = -2x + 3)$ PARALLEL	$-2y = -3x + 1$ $(y = \frac{3}{2}x + \frac{1}{2})$ $2x + 3y = 18$ $3y = -2x + 18$ $(y = -\frac{2}{3}x + 6)$