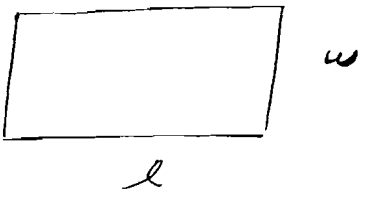
Section 5.2 HW Solutions

No. 5.2
Date 1

Problem	Ans	Reason
1		ℓ = length in inches w = width in inches $\ell = (1.3)w$ $\ell + w = 115$



2 N = number of Large muffins baked each day

n = " " small " "

$300 = 4N + 1n$

$160 = 2N + 1n$

size	Oz Dough	Oz bran
Large	4	2
small	1	1

3 A = number of adventure games produced

F = number of fantasy games produced

$16800 = 200A + 400F$

$6000 = 500A + 100F$

Problem	Ans	Reason

4

s = Mary's speed in meters/min

$1.1s$ = Sally's speed

$400 = s\,2$

d = distance in meters Sally has run when they meet

$d - 400$ = distance Mary has run when they meet

$$\frac{d}{1.1s} = \frac{d-400}{s}$$

dist = time × speed

both spent same time

Problem 5

Ingredients

type	grams Sunflower	grams peanuts	grams raisins
Hikers mix	6	40	20
Mountain mix	5	20	60

h = number of packages of Hiker mix
m = " " Mountain mix

$$2700 = 6h + 5m$$
$$12000 = 40h + 20m$$
$$18000 = 20h + 60m$$

Using the last two equations find

$h = 180$
$m = 240$

But $6 \cdot 180 + 5 \cdot 240 = 1080 + 1200$

$= 2280$

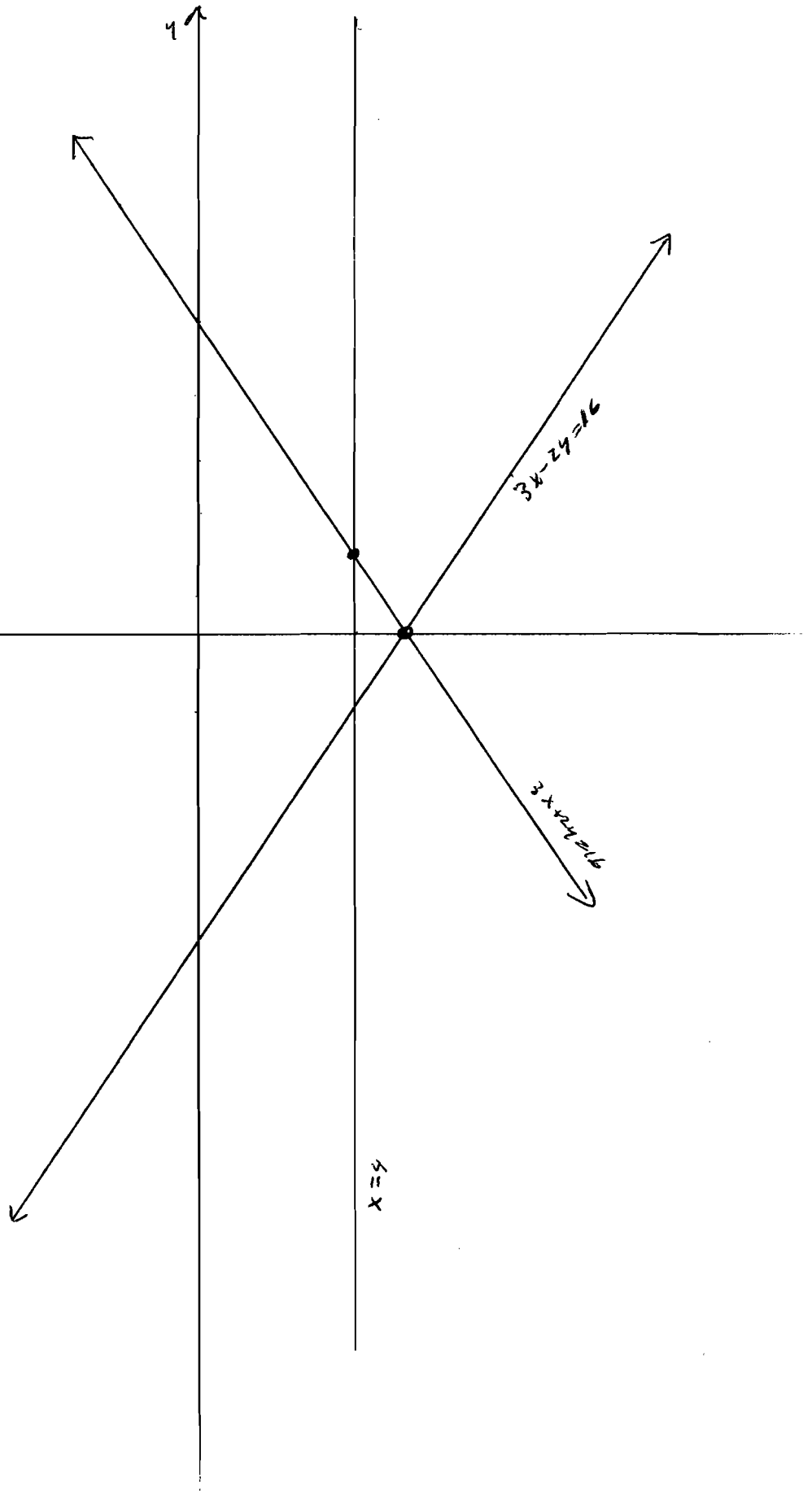
$\neq 2700$

so no solution. Margaret can't do it.

Problem

6 (a) $x = 4$
$y = 2$

(b) $x = \frac{16}{3}$
$y = 0$

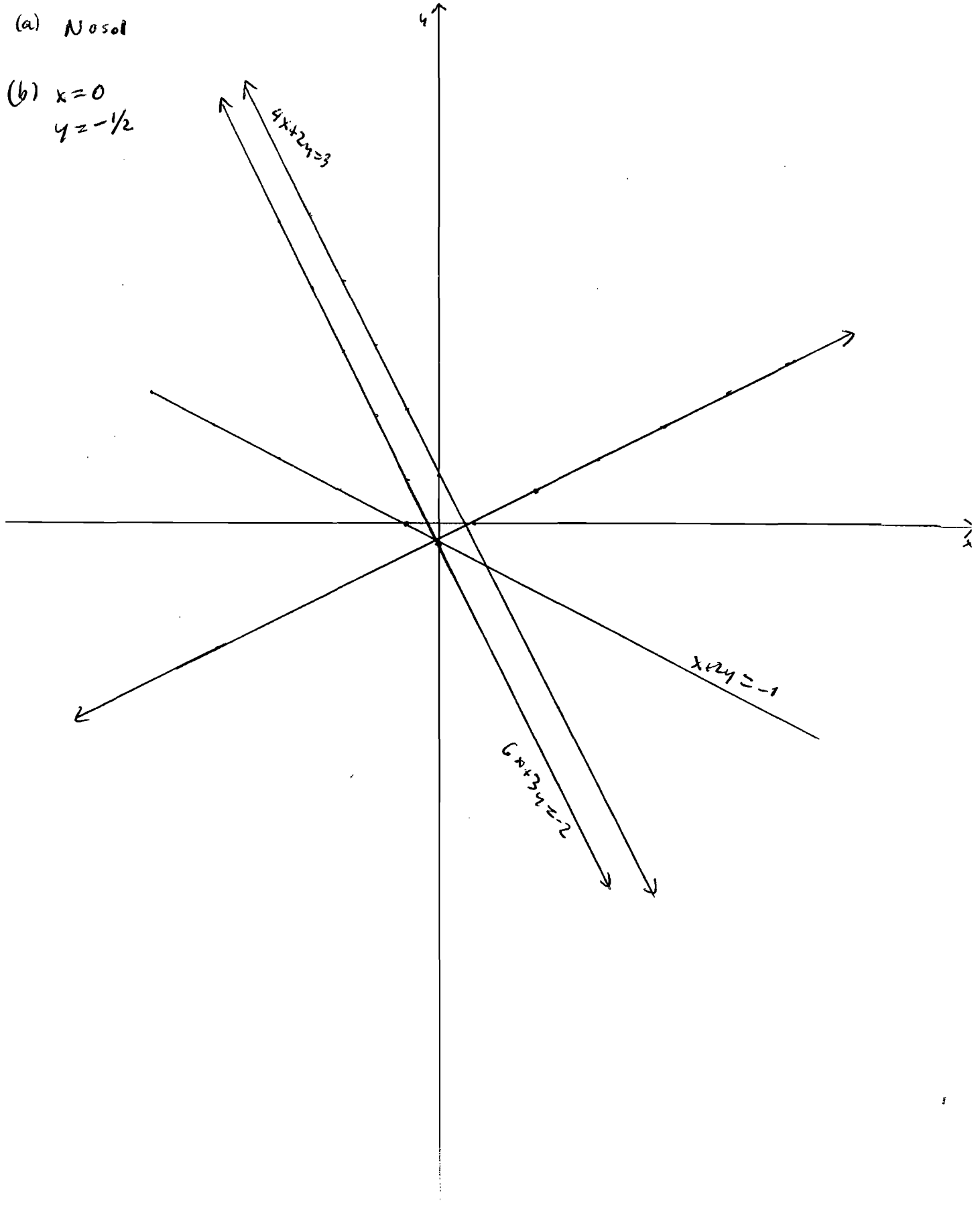


Problem

4

(a) No sol

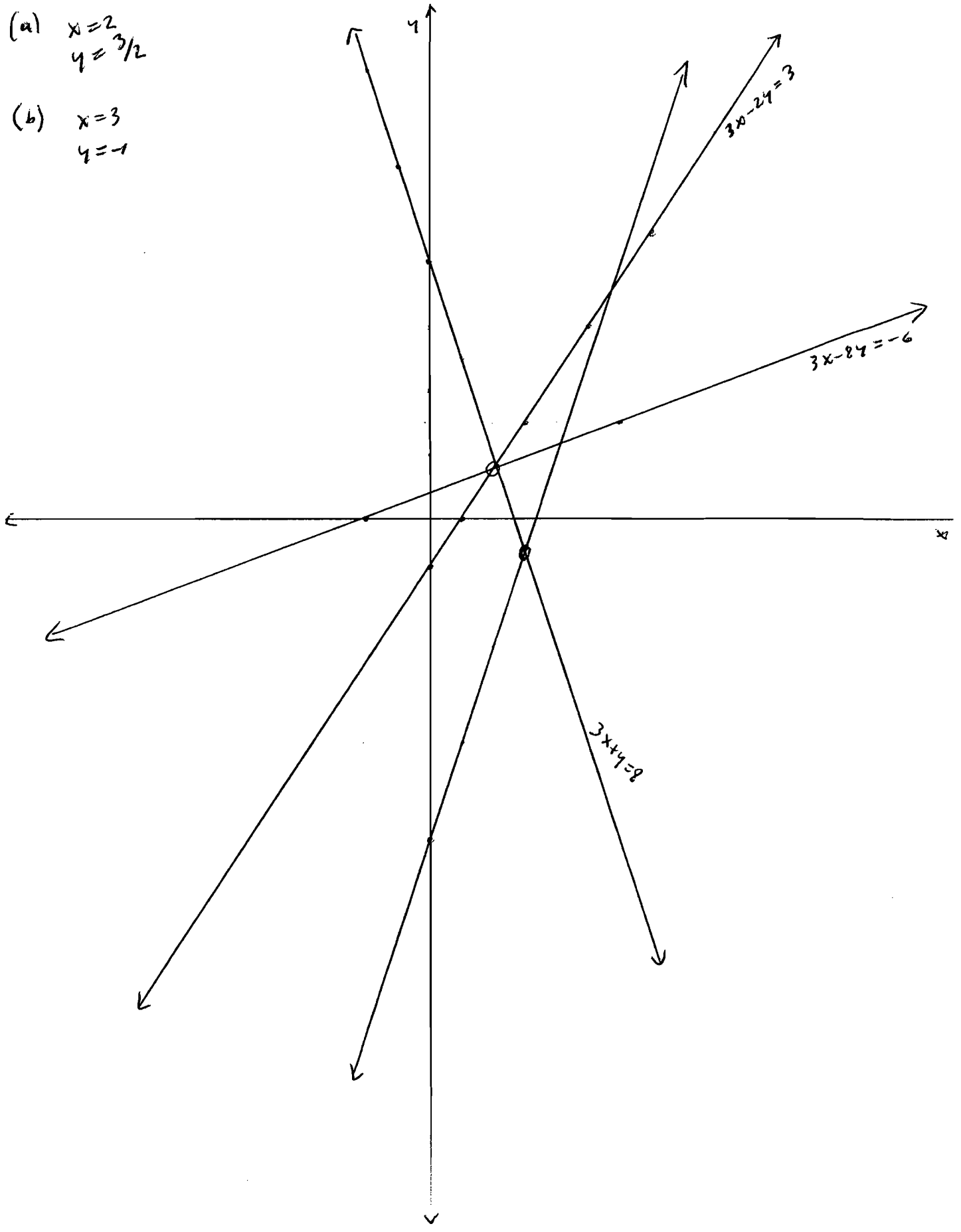
(b) $x = 0$
$y = -1/2$



8

(a) $x = 2$
$y = 3/2$

(b) $x = 3$
$y = -1$

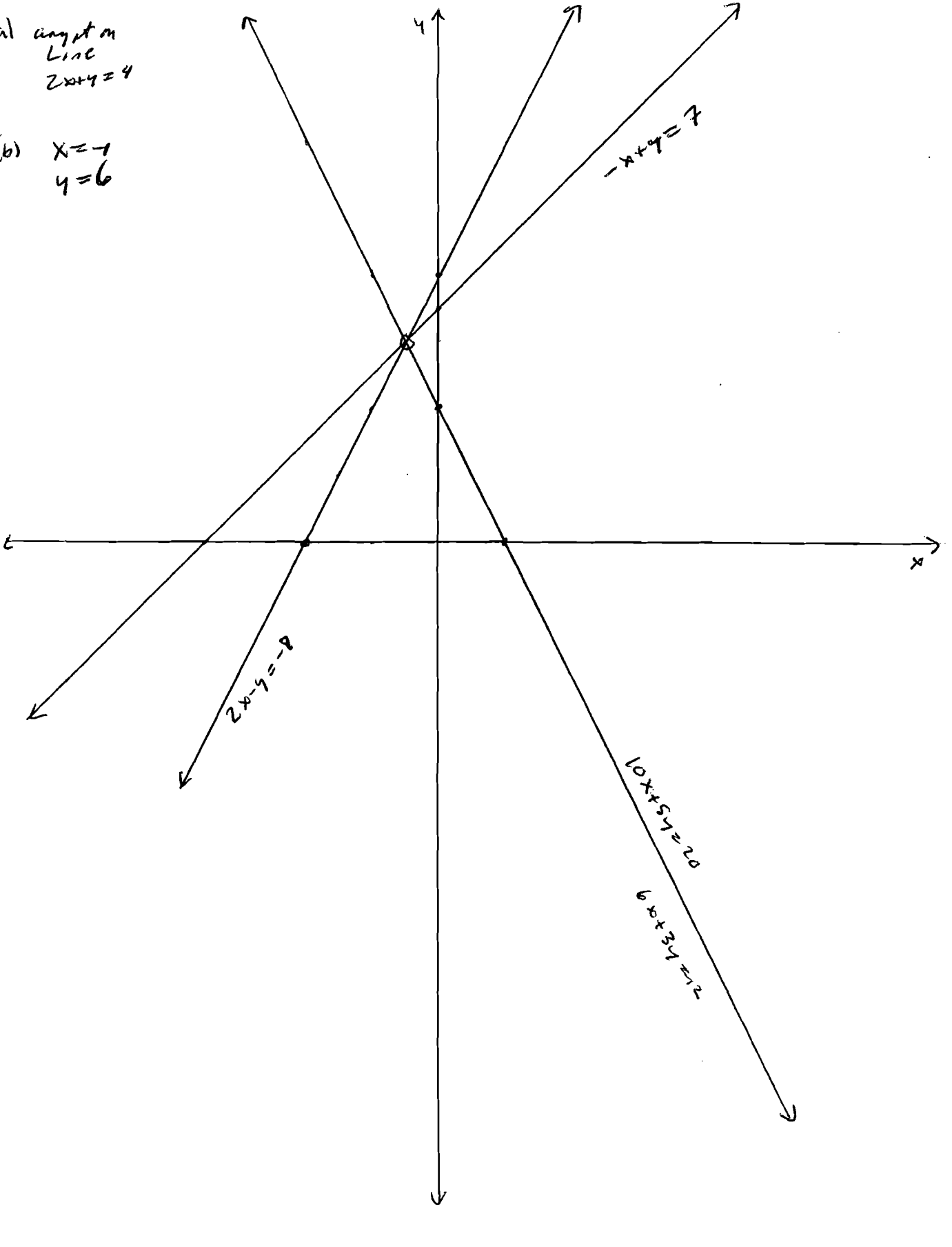


Problem

9

(a) any point on Line $2x+y=4$

(b) $x=-1$
$y=6$



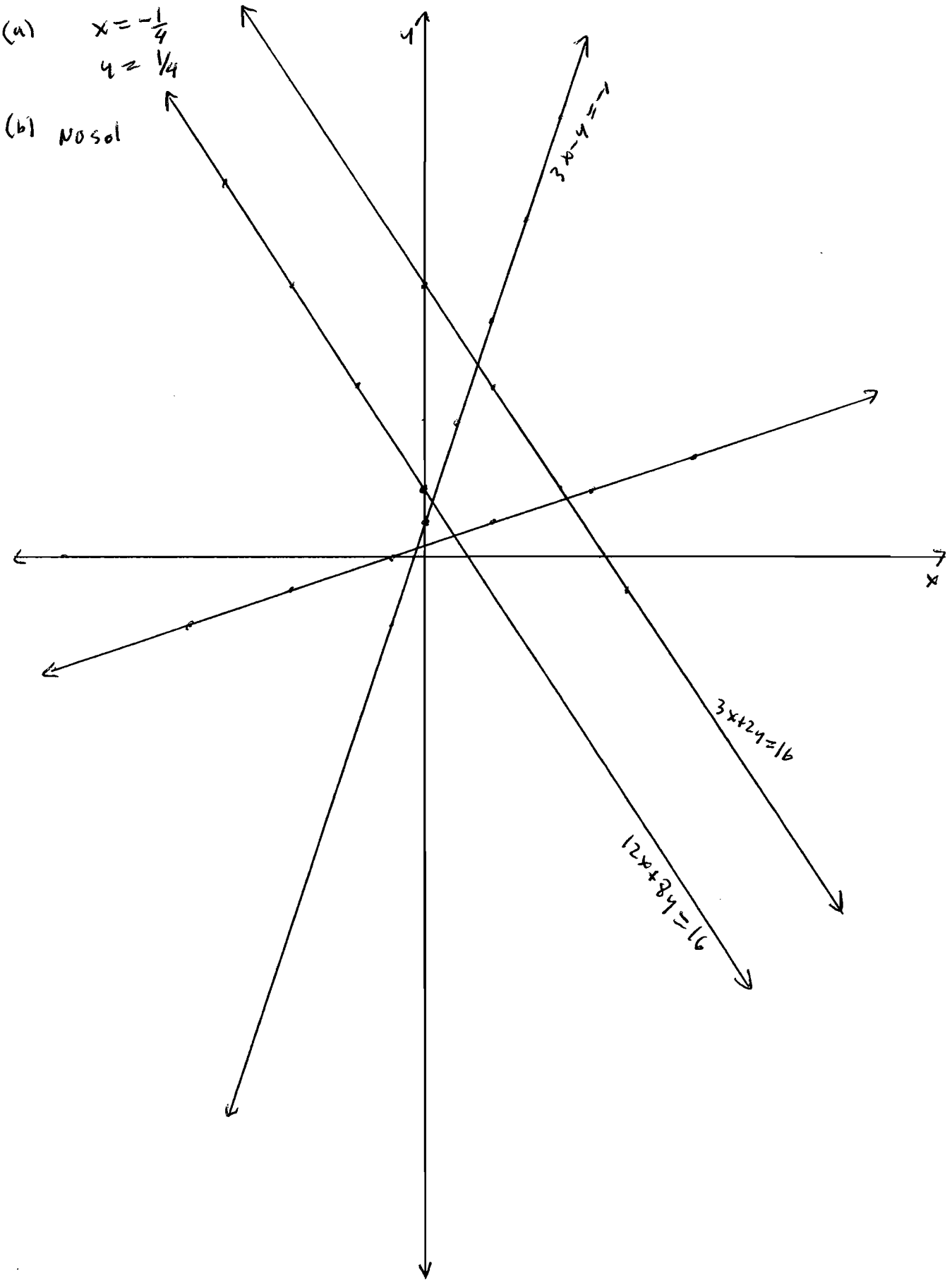
Problem

10

(a) $x = -\frac{1}{4}$

$y = 1/4$

(b) No sol



Problem	Ans	Reason
11	$w = 50$ $\ell = 65$	$\ell = 1.3w$ $\ell + w = 115$ $1.3w + w = 115$ $2.3w = 115$ $w = \frac{115}{2.3} = 50$ $\ell = 1.3 \cdot 50 = 65$
12	$N = 70$ $n = 20$	$300 = 4N + n$ $160 = 2N + n$ $2N = 300 - 160 = 140$ $N = 70$ $n = 160 - 2 \cdot 70 = 160 - 140 = 20$
13	$A = 4$ $F = 40$	$16800 = 200A + 400F$ $6000 = 500A + 100F$ $168 = 2A + 4F$ $60 = 5A + F$ $F = 60 - 5A$ $168 = 2A + 4(60 - 5A)$ $= 240 - 18A$ $A = \frac{240 - 168}{18} = \frac{72}{18} = 4$ $F = 60 - 5 \cdot 4 = 60 - 20 = 40$

Problem	Ans	Reason
14	4400 meters	$400 = 2s$

$$\frac{d}{1.1s} = \frac{d-400}{s}$$

$$s = \frac{400}{2} = 200$$

$$\frac{d}{1.1} = d - 400$$

$$d = 1.1d - 440$$

$$440 = (.1)d \qquad d = 4400$$

time elapsed 20 min
Mary's speed 200 meters/min
Sally's speed 220 meters/min
Mary's dist 4000 meters
Sally's dist 4400 meters

Problem

15 $t = \frac{9500}{1325} \approx 7.17$ t = number of years elapsed

$$p = 50000 + t\,7500$$
$$p = 1000000 - t\,125000$$

$$500 + 75t = 10000 - 1250t$$

$$1325t = 9500$$
$$t = \frac{9500}{1325}$$

16 9 years later, a start of 2013

At that time Common sales is 4.2 billion

t = # years elapsed since start of 2004

s = dollar sales (in billions)

$$s = 1.5 + t(.3) \quad \text{: div A}$$

$$s = .6 + t(.4) \quad \text{: div B}$$

$$1.5 + .3t = .6 + .4t$$
$$1.5 - .6 = .1t$$
$$15 - 6 = t$$
$$9 = t$$

Problem	Ans	Reason
17	$400,000 util $600,000 sav	u = dollar amt in utilities s = dollar amt in savings $u + s = 1000000$ $.12u = .08s$ $12u = 8s$ $3u = 2s$ $3u = 2(1000000 - u)$ $5u = 2000000$ $u = 400000$ $s = 600000$
18	$250 000 util $750000 sav	$u + s = 1000000$ $.08s = 2(.12u)$ $8s = 24u$ $s = 3u$ $3u = 1000000 - u$ $4u = 1000000$ $u = 250000$ $s = 750000$

Problem	Ans	Reason
19 Bkwrong	$450 000 util $550 000 sav	$u + s = 1000\,000$ $.12u = .08s + 10000$ $.12u = .08(1000000 - u) + 10000$ $.12u + .08u = 80000 + 10000$ $.2u = 90000$ $u = 450\,000$ $s = 550\,000$
20	5 years	t = number of years elapsed s = sales (in millions) $s = 5 + t(.35)$ $s = 2 + t(.95)$ $5 + .35t = 2 + .95t$ $3 = .6t$ $30 = 6t$ $t = 5$

Problem	Ans	Reason
21	$30 000 stock X $70000 stock Y	x = dollar amt in stock X y = ... Y

$$x + y = 100\,000$$

$$.1x + .3y = 24000$$

$$.1x + .3(100\,000 - x) = 24000$$

$$-.2x = 24000 - 30000 = -6000$$

$$.2x = 6000$$

$$2x = 60000$$

$$x = 30,000$$

22	$60000 stock X $58 000 stock Y	

$$x + y = 124000$$

$$.1X + .3Y = 24000$$

$$.1x + .3(124000 - x) = 24000$$

$$-.2x = 24000 - 37200 = -12800$$

$$.2x = 12800$$

$$2x = 128000$$

$$x = 60000$$

$$y = 58000$$

Problem	Ans	Reason
23	$a = 5$ million $b = 2.5$ million $r = 2.5$ million	a = dollar amt in stocks b = " " bonds r = " " real estate

$$a + b + r = 10{,}000{,}000$$

$$a = 2b$$

$$a + b = 3r \quad \Rightarrow \quad 2b + b = 3r$$
$$3b = 3r$$
$$b = r$$

$$2b + b + b = 10{,}000{,}000$$
$$4b = 10{,}000{,}000$$
$$b = 2\,500\,000$$
$$a = 5\,000\,000$$
$$r = 2\,500\,000$$

24	$a = 1/3$ $b = 4/3$	$x - 3y = a$ $2x + 7y = 5$	take $x = b$ $y = a$

$$b - 3a = a$$
$$2b + 7a = 5$$

$$b = 4a$$
$$8a + 7a = 5$$
$$15a = 5$$
$$a = 5/15 = 1/3$$
$$b = 4/3$$

Problems	Ans	Reason
25	$a = 1/2$ $b = 5/2$	$ax + 4 = 3$ at $x=1$ $-x + 2y = 4$ $4=6$ $a + b = 3$ $-1 + 2b = 4$ $2b = 5$ $b = 5/2$ $a = 3 - 5/2 = \frac{6}{2} - \frac{5}{2} = \frac{1}{2}$
26	exceptional value for a is 4 In this case no sols	For $a = 4$ eq $-6x + ay = 8$ is -2 times $3x - 2y = -4$

Problem	Ans	Reason
27	Apples cost 35¢ each oranges cost 30¢ each Toms story incompatible with this	x = cost of 1 apple y = cost of 1 orange

Tom story $20x + 20y = 8$

Dick story $15x + 5y = 6.75$ (or)

Harry story $10x + 25y = 11.00$ (or)

$$10x + 25(1.35 - 3x) = 11.00$$
$$10x - 75x = 11 - 33.75$$
$$-65x = -22.75$$
$$x = \frac{22.75}{65} = .35$$

Problem	Ans	Reason
28	30 Large 40 small 3 oz raisins left.	Requirements (oz)

	Dough	Apples	Raisins
Large	5	2	.5
Small	3	1	.3
total	270 (use all)	100 (use all)	30

ℓ = # muffins of Large type
s = # muffins small type

Dough: $5\ell + 3s = 270$
Apples $2\ell + 1s = 100$

$$5\ell + 3(100 - 2\ell) = 270$$

$$-\ell = 270 - 300 = -30$$
$$\ell = 30$$
$$s = 100 - 2 \cdot 30$$
$$= 100 - 60$$
$$= 40$$

$$30 - .5(30) - .3(40) = 30 - 15 - 12$$
$$= 30 - 27$$
$$= 3$$

Problem	Ans	Reason
29	(Not enough raisins) 50 Large muffins 0 small muffins uses up all the apples, raisins	$(.5)\ell + (.3)s = 25$ $5\ell + 3s = 250$ Can never use all dough and raisins Require $5\ell + 3s = 250$ $2\ell + s = 100$ $5\ell + 3(100 - 2\ell) = 250$ $-\ell = 250 - 300 = -50$ $\ell = 50$ $s = 0$

Problem	Ans	Reason
30	420 grams of sunflow left after me 180 pkg Hitter mix 240 pkg Mountain m.	$12000 = 40h + 20m$ $18000 = 20h + 60m$ $1200 = 4h + 2m$ $1800 = 2h + 6m$

$$1800 = 2h + 3(1200 - 4h)$$

$$1800 - 3600 = -10h$$

$$10h = 1800$$

$$h = 180$$

$$m = 600 - 2(180)$$

$$m = 240$$

amt sunflower left is

$$2700 - 6 \cdot 180 - 5 \cdot 240$$

$$= 2700 - 1080 - 1200$$

$$= 420$$

Problem	Ans	Reason

31	No	n = # trips on North Fork
		b = # trips on Blue George

Requirements for one trip

	day guide time	hrs support staff
NF	20	50
BG	40	10

$1680 = n20 + b40$ (guide time)

$600 = n50 + b10$ (sup staff time)

$168 = 2n + 4b$

$60 = 5n + b$

$168 = 2n + 4(60 - 5n)$

$168 - 240 = -18n$

$72 = 18n$

$n = 4$

Problem	Ans	Reason
32	90 hrs	x = # hours extra sup staff time

Require $n = 6$

$$1680 = \underset{120}{6 \cdot 20} + 640$$

$$600 + x = \underset{300}{6 \cdot 50} + 610$$

$$168 = 12 + 46$$

$$6 = \frac{168 - 12}{4}$$

$$= 156/4$$

$$= 39$$

$$x = 39 \cdot 10 + 300 - 600$$
$$= 390 - 300$$
$$= 90$$

check: $n = 6$ $\quad b = 39$

$$1680 \overset{\checkmark}{=} 6 \cdot 20 + 39 \cdot 40$$
$$690 \overset{\checkmark}{=} 6 \cdot 50 + 39 \cdot 10$$

□