7.R HW Solutions

Problem 1

	cm pine hull	cm mahogany	# plastic fittings	dollar profit
Lobster	25	4	2	7
tug	20	8	8	15
Supply	3000	720	640	

Let

x = # lobster boats built that week

y = # tug boats built that week

Maximize

$$7x + 15y$$

Subject to

$$x \geq 0$$

$$y \geq 0$$

$$25x + 20y \leq 3000$$

$$4x + 8y \leq 720$$

$$2x + 8y \leq 640$$

Problem 2

	oz Leather	sq ft nylon	oz rubber	min Labor	dollar profit
Dunker	6	.6	10	7	16
Flyer	8	.4	12	9	24
Supply	320	150	800	1200	

1 L6 = 16 oz

20	50	20
16	16	60
320	800	1200

Let

x = # of Dunker shoes produced

y = # of Flyer shoes produced

Maximize

$$16x + 24y$$

Subject to

$$x \geq 0$$
$$y \geq 0$$
$$6x + 8y \leq 320$$
$$.6x + .4y \leq 150$$
$$10x + 12y \leq 800$$
$$7x + 9y \leq 1200$$

Problem 3

	# person-day Labor	$ Capital	$ Rev
1 acre A	1	90	170
1 acre B	2	60	190
Supply	3000	150,000	

x = # acres for crop A
y = # acres for crop B

Maximize

$$170x + 190y$$

Subject to

$$x \geq 0$$
$$y \geq 0$$
$$x + y \leq 2000$$
$$x + 2y \leq 3000$$
$$90x + 60y \leq 150000$$

oblem

4

	# rafts	# kayaks	dollar Cost
1 day on trout	50	20	1000
1 day Salamander	60	40	1200
Demand	1800	1000	

Let

x = # days on trout river

y = # days on Salamander river

Minimize

$$1000x + 1200y$$

subject to

$$x \geq 0$$

$$y \geq 0$$

$$50x + 60y \geq 1800$$

$$20x + 40y \geq 1000$$

Problem

5

	pieces pine	pieces cedar	Profit
basic	4	3	3
Upscale	2	5	10
Supply	180	280	

Let x = # basic bird houses produced
y = # upscale bird houses produced

Maximize

$$3x + 10y$$

Subject to

$$x \geq 10$$
$$y \geq 20$$
$$4x + 2y \leq 180$$
$$3x + 5y \leq 280$$

Problem 6

	oz gold	oz silver	Copper	Cost
(1 day) Alpha	30	200	400	8000
(1 day) Omega	40	400	300	12 000
Require	300	3000	2000	

x = # days to operate Alpha mine
y = # days to operate Omega mine

Minimize

$$8000x + 12000y$$

subject to

$$x \geq 0$$
$$y \geq 0$$
$$30x + 40y \geq 300$$
$$200x + 400y \geq 3000$$
$$400x + 300y \geq 2000$$

Problem 7

	Lb Nitrogen	Lb Phos	Lb Potash	dollar Profit
Standard	20	5	5	10
special	10	10	10	5
Super	5	15	10	
Available	2000	1500	1500	

x = # sacks standard
y = # sacks special
z = # sacks super

Maximize

$$10x + 5y + 15z$$

Subject to

$$x \geq 0 \quad y \geq 0 \quad z \geq 0$$
$$20x + 10y + 5z \leq 2000$$
$$5x + 10y + 15z \leq 1500$$
$$5x + 10y + 10z \leq 1500$$

Problem 8

	Lb metal	Lb Fiberglass	dollar profit
(100) Left Hand	1	5	200
(100) Right Hand	2	3	250
Supply	65	150	

x = # Left handed widgets (in 100's)
y = # right " "

Maximize

$$200x + 250y$$

Subject to

$$x \geq 0$$
$$y \geq 0$$
$$x + 2y \leq 65$$
$$5x + 3y \leq 150$$

Problem

9

Corner

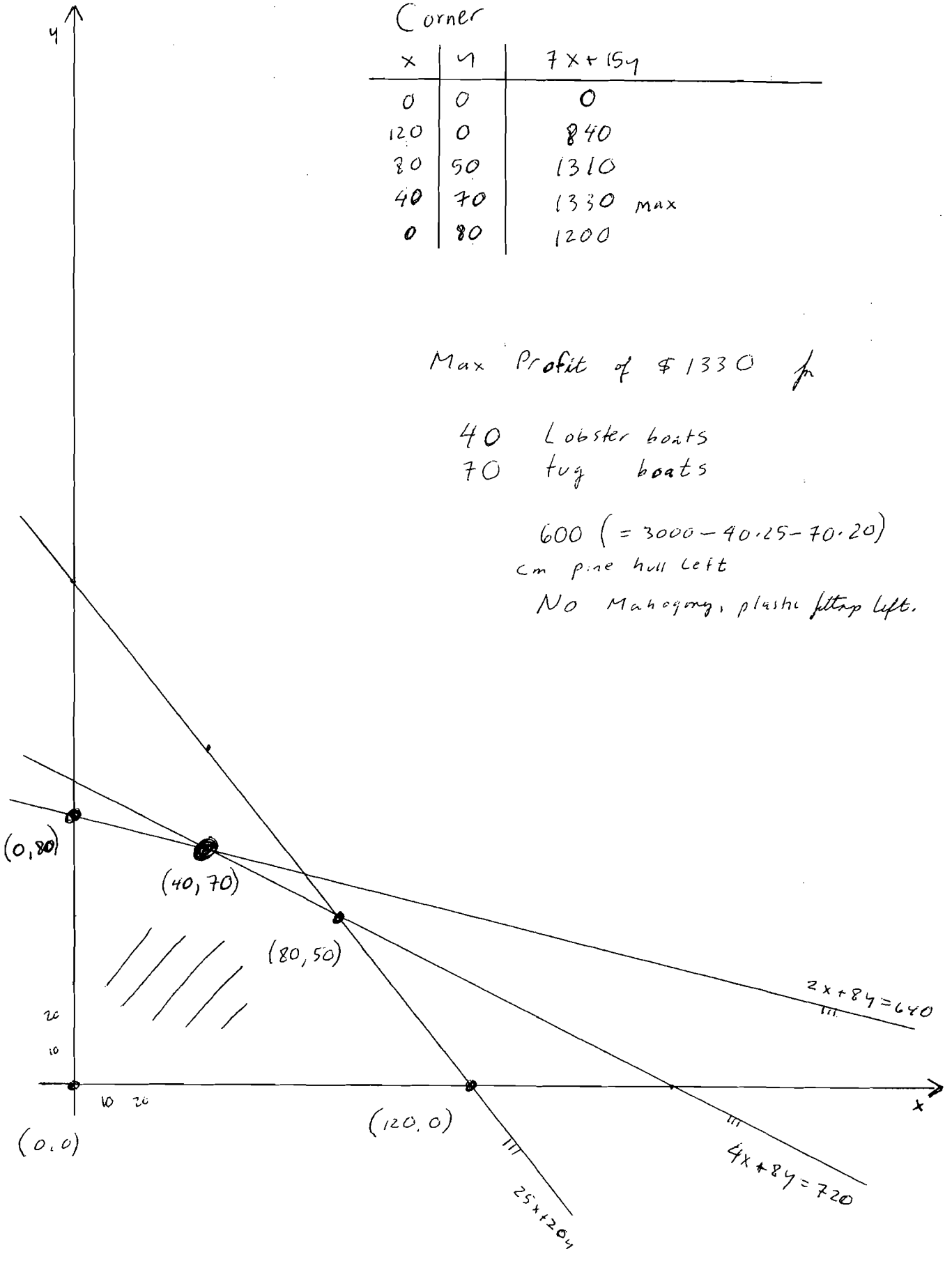
x	y	7x + 15y	
0	0	0	
120	0	840	
80	50	1310	
40	70	1330	max
0	80	1200	

Max Profit of $1330

40 Lobster boats
70 tug boats

600 (= 3000 − 40·25 − 70·20) cm pine hull left

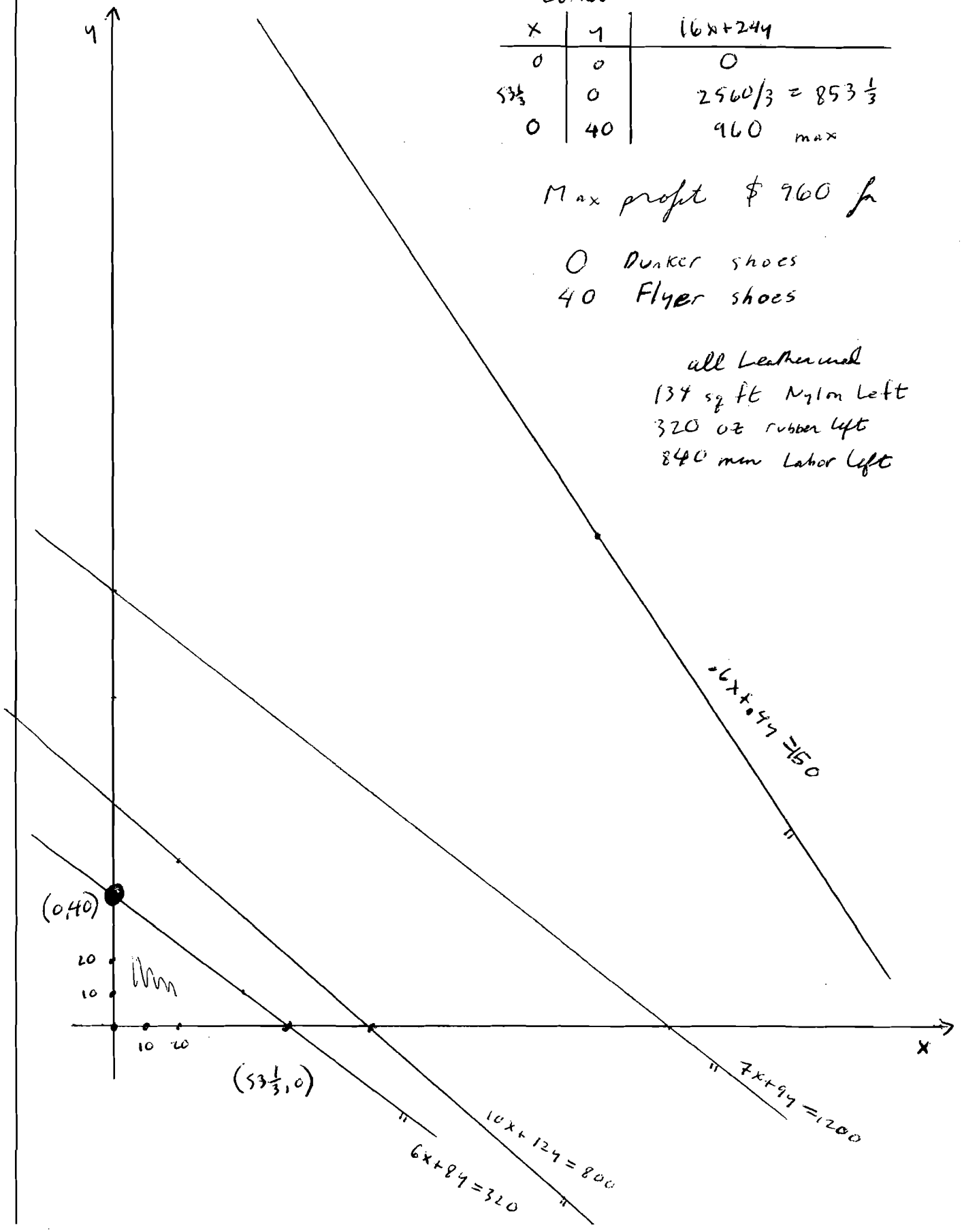
No Mahogany, plastic fittap left.



F, R
10

Problem

10



Corner

x	y	16x+24y
0	0	0
$53\frac{1}{3}$	0	$2560/3 = 853\frac{1}{3}$
0	40	960 max

Max profit $ 960

0 Dunker shoes
40 Flyer shoes

all Leather used
134 sq ft Nylon Left
320 oz rubber left
840 min Labor Left

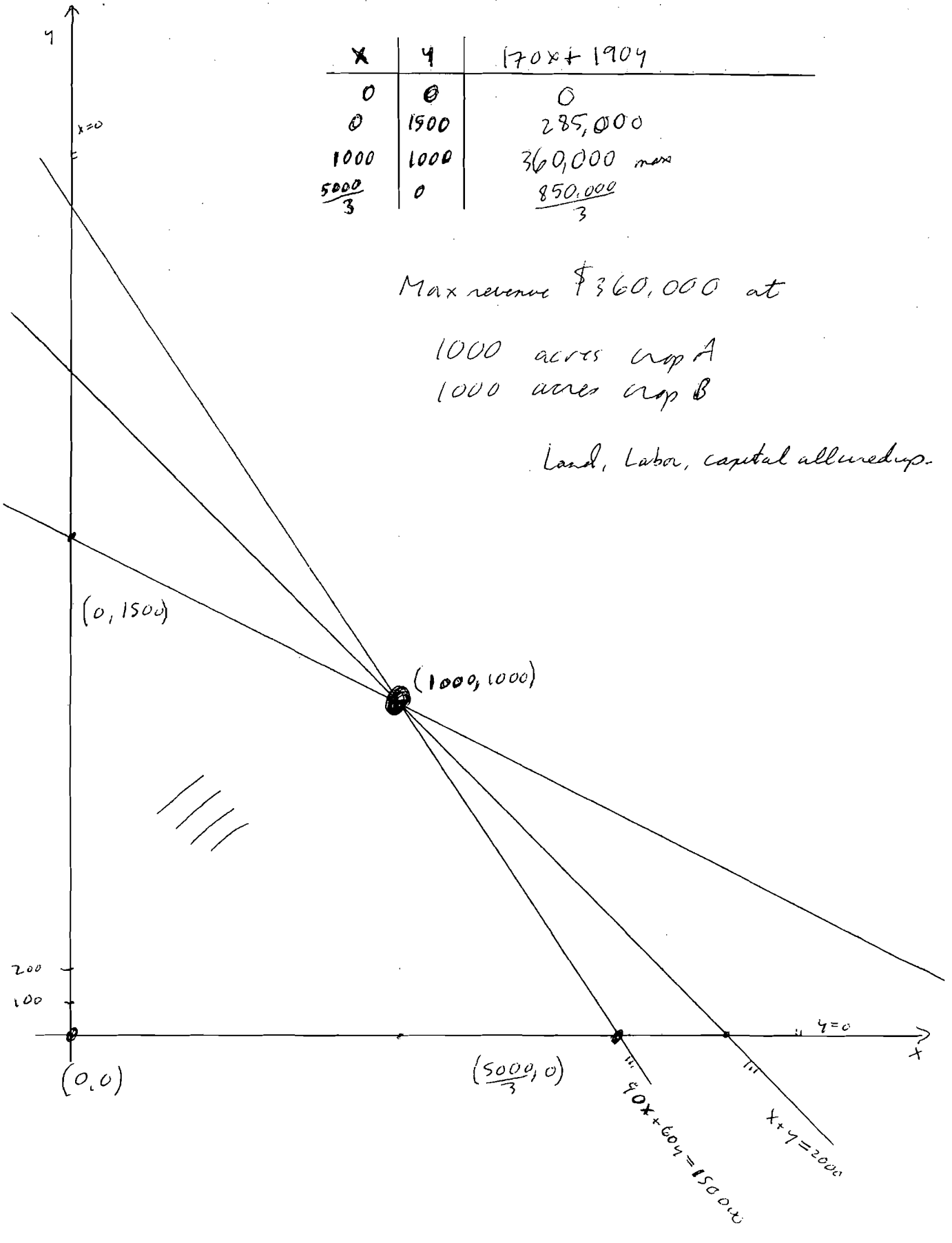
Problem 11

x	y	170x + 190y
0	0	0
0	1500	285,000
1000	1000	360,000 max
$\frac{5000}{3}$	0	$\frac{850,000}{3}$

Max revenue $360,000 at

1000 acres crop A
1000 acres crop B

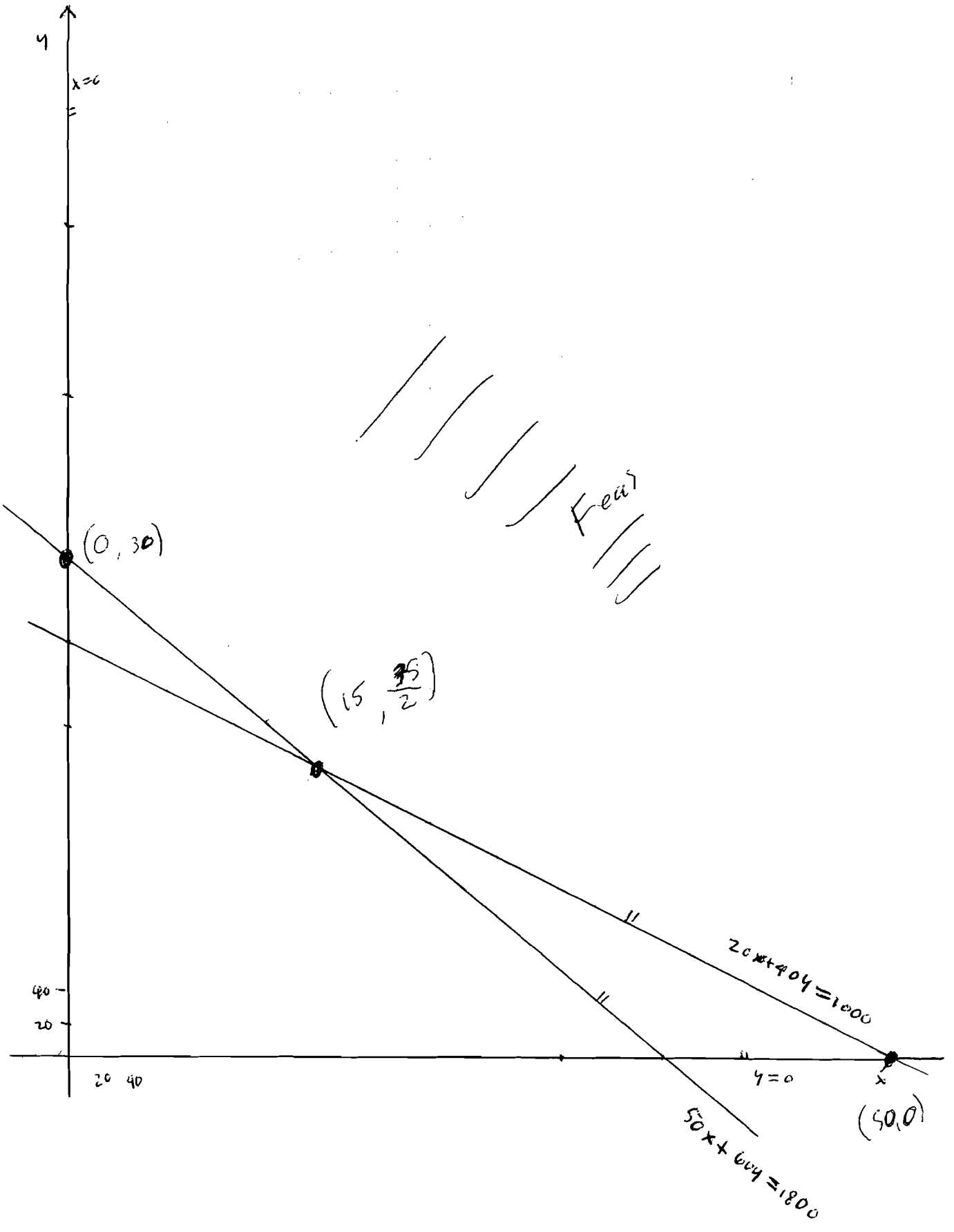
Land, Labor, capital allocated.



Problem

T. R
12

12



F.R

No.

Date 13

Problem

12

x	y	$1000x + 1200y$
0	30	36,000 mm
50	0	50,000
15	$\frac{35}{2}$	36000 mm

Min Cost $\$36000$ for both Combinations

0 days on trout
30 days on Salamander

OR

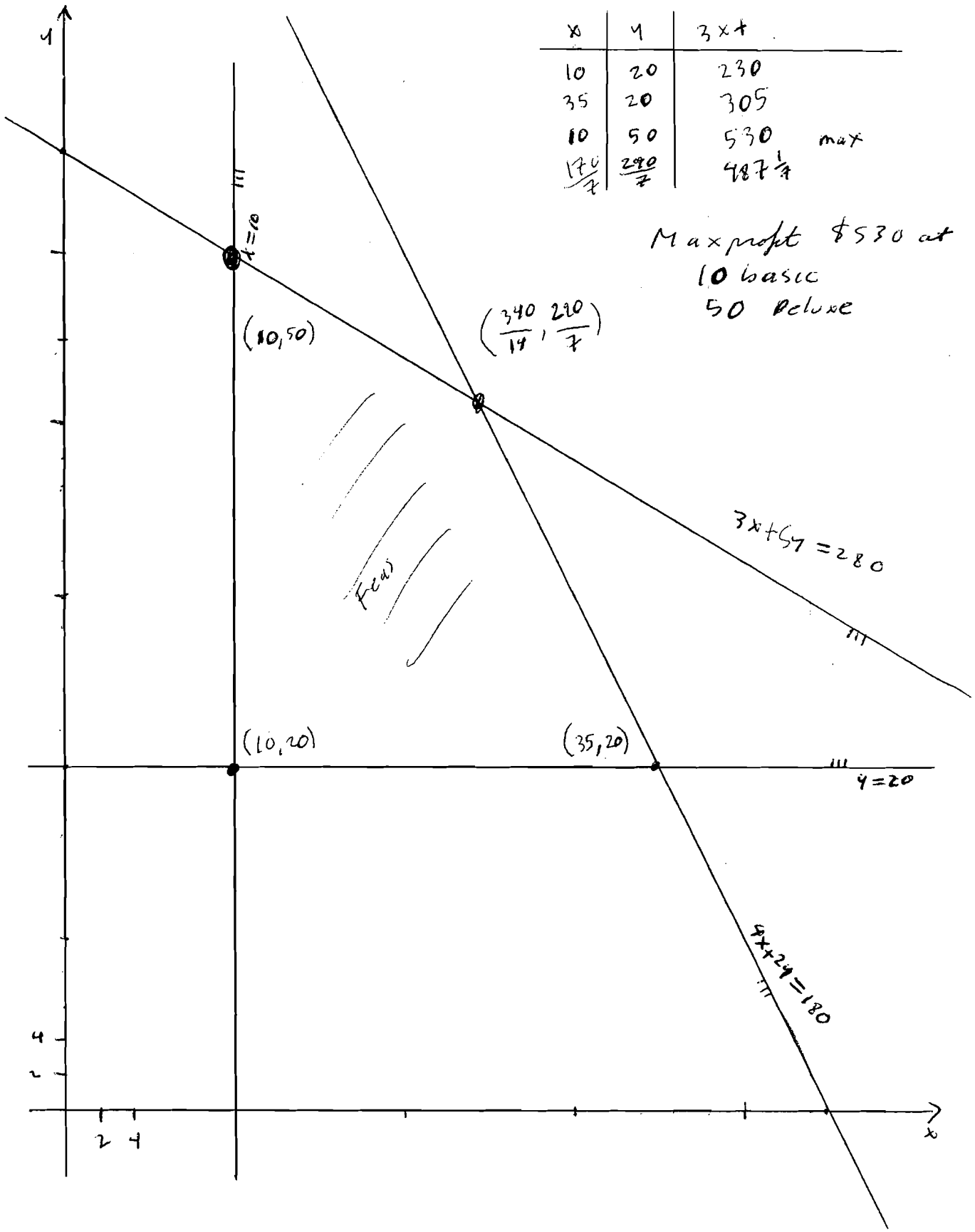
15 days on trout
35/2 days on Salamander

Problem

13

x	y	3x+y	
10	20	230	
35	20	305	
10	50	530	max
$\frac{170}{7}$	$\frac{290}{7}$	$487\frac{1}{7}$	

Max profit $530 at
10 basic
50 deluxe



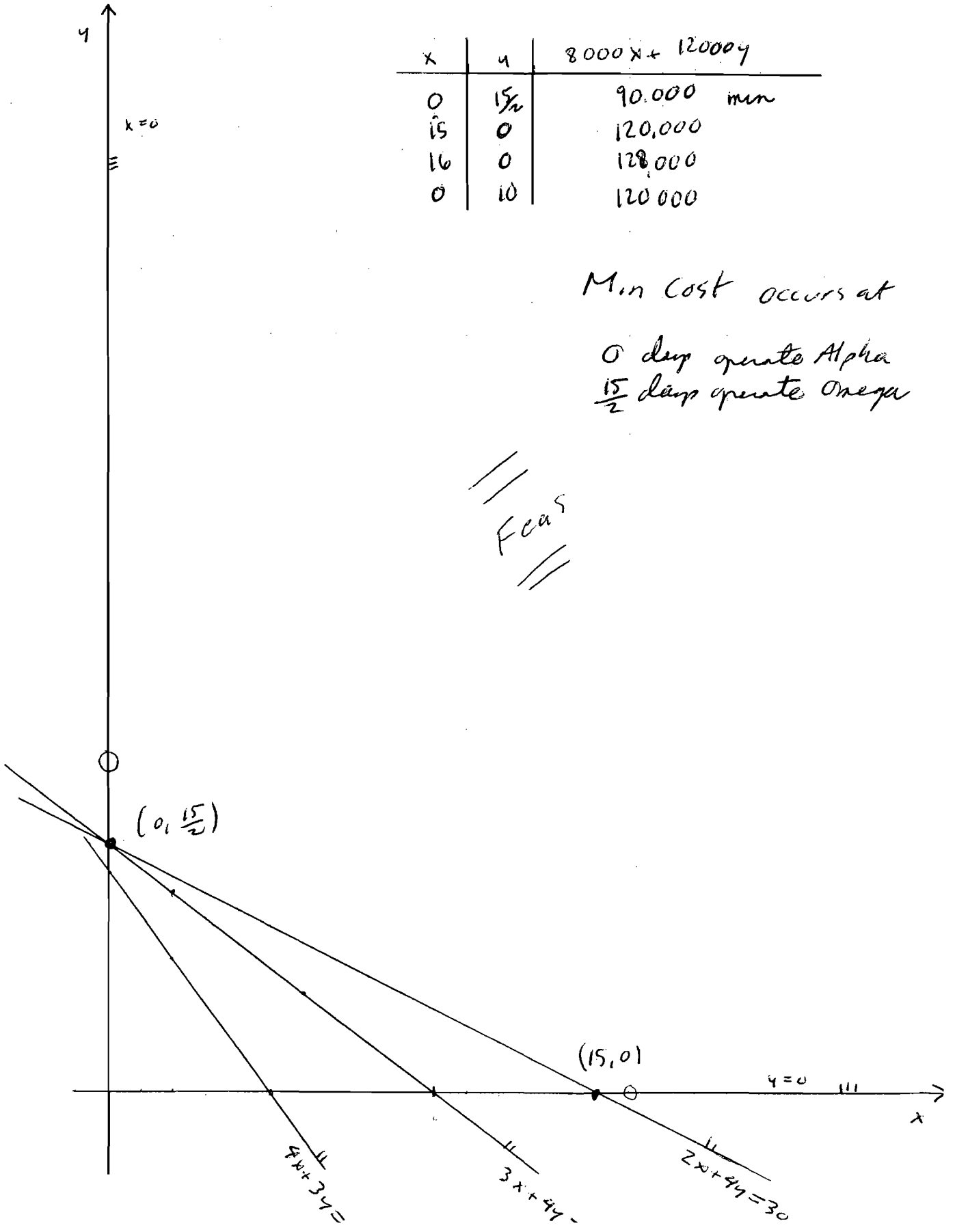
Problem

14

x	y	8000x + 12000y
0	15/2	90.000 min
15	0	120,000
16	0	128,000
0	10	120 000

Min Cost occurs at

0 days operate Alpha
$\frac{15}{2}$ days operate Omega



Problem

15

skip

typo in Sols

Find corners of Feas set.

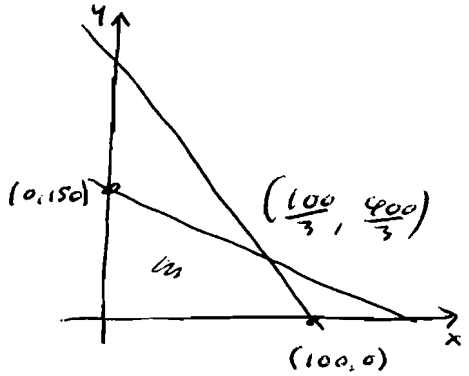
Case $x>0,\ y>0,\ z>0$

$$20x+10y+5z=2000$$
$$5x+10y+15z=1500$$
$$5x+10y+10z=1500$$

Require $z=0$ No sol.

Case $z=0$

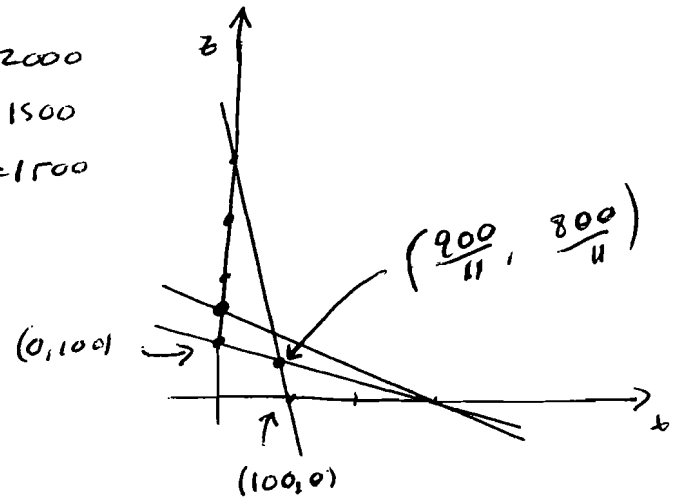
$$20x+10y\le 2000$$
$$5x+10y\le 1500$$



$(0,150,0)$, $(100,0,0)$, $(\frac{100}{3},\frac{400}{3},0)$

Case $y=0$

$$20x+5z\le 2000$$
$$5x+15z\le 1500$$
$$5x+10z\le 1500$$



$(0,0,100)$

$(100,0,0)$

$(\frac{900}{11},0,\frac{800}{11})$

Problem

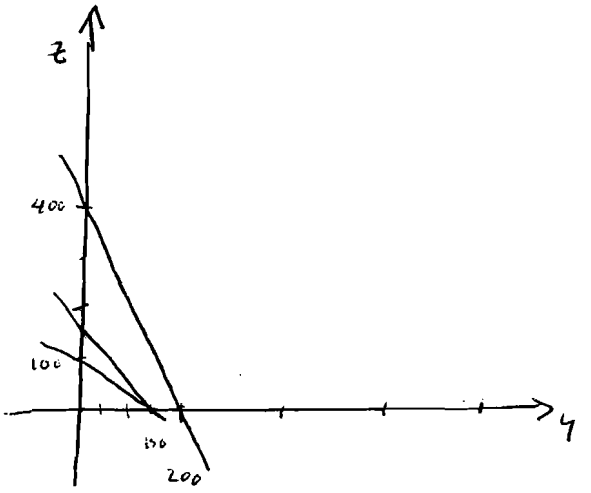
15, cont

Case $x = 0$

$10y + 5z \leq 2000$

$10y + 15z \leq 1500$

$10y + 10z \leq 1500$



(0, 0, 100)

(0, 150, 0)

x	y	z	$10x + 5y + 15z$
0	0	0	0
0	0	100	1500
0	150	0	750
100	0	0	1000
$\frac{100}{3}$	$\frac{400}{3}$	0	1000
$\frac{900}{11}$	0	$\frac{800}{11}$	$\frac{21000}{11} = 1909\frac{1}{11}$

Max profit $\$\frac{21000}{11}$ at

$\frac{900}{11}$ sacks standard

0 sacks special

$\frac{800}{11}$ sacks super

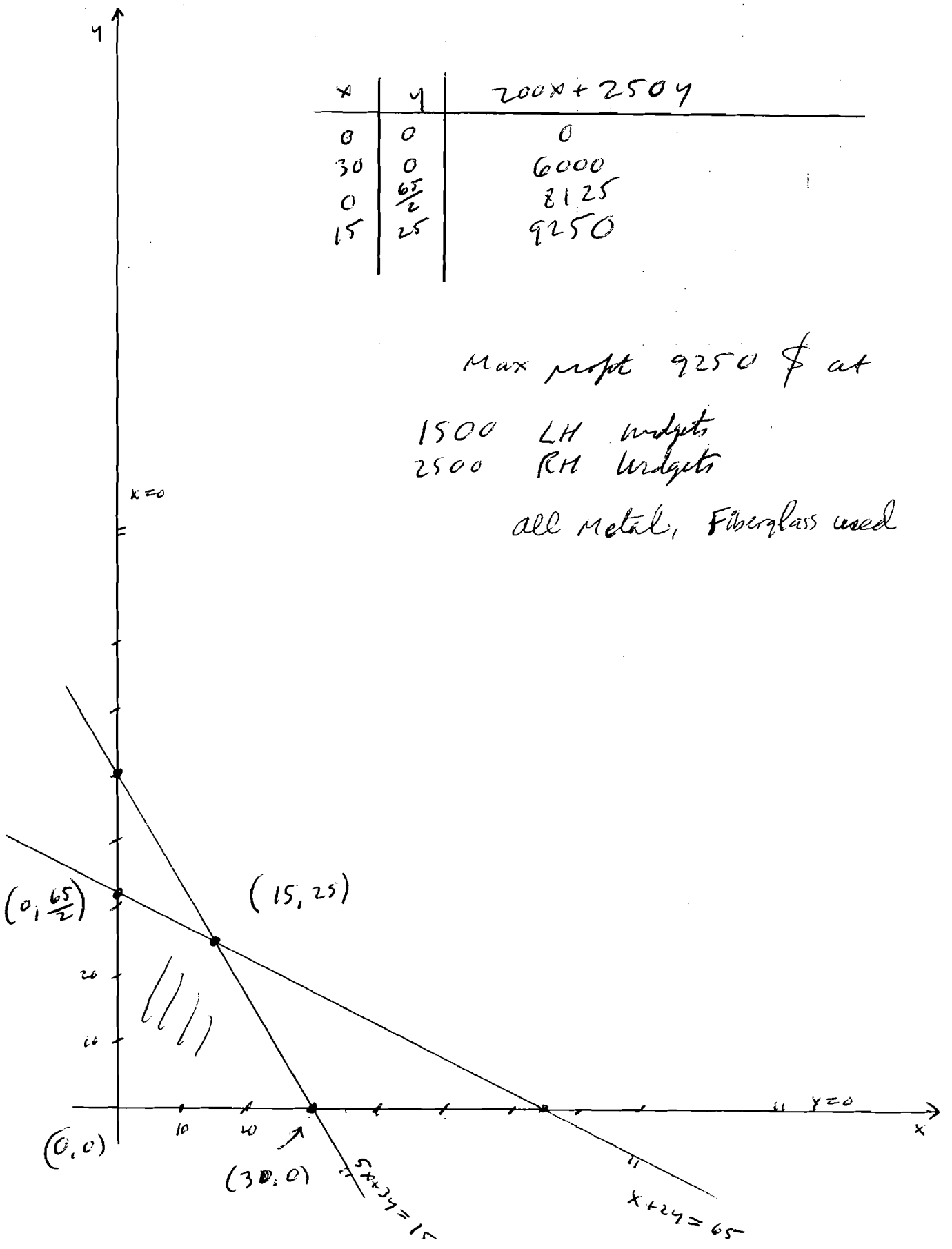
Problem 16

x	y	200x + 250y
0	0	0
30	0	6000
0	$\frac{65}{2}$	8125
15	25	9250

Max profit 9250 $ at

1500 LH widgets
2500 RH widgets

all metal, Fiberglass used



Problem

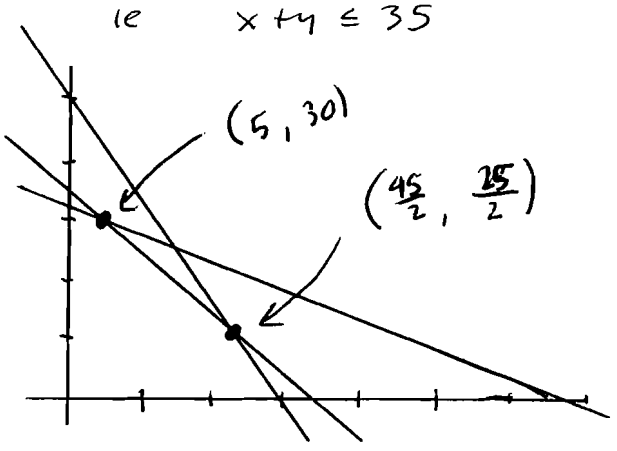
17 should make $\frac{65}{2} \cdot 100 = 3250$

RH widgets

18 m8 Add extra constraint

$$10x + 10y \leq 350$$

ie $x + y \leq 35$

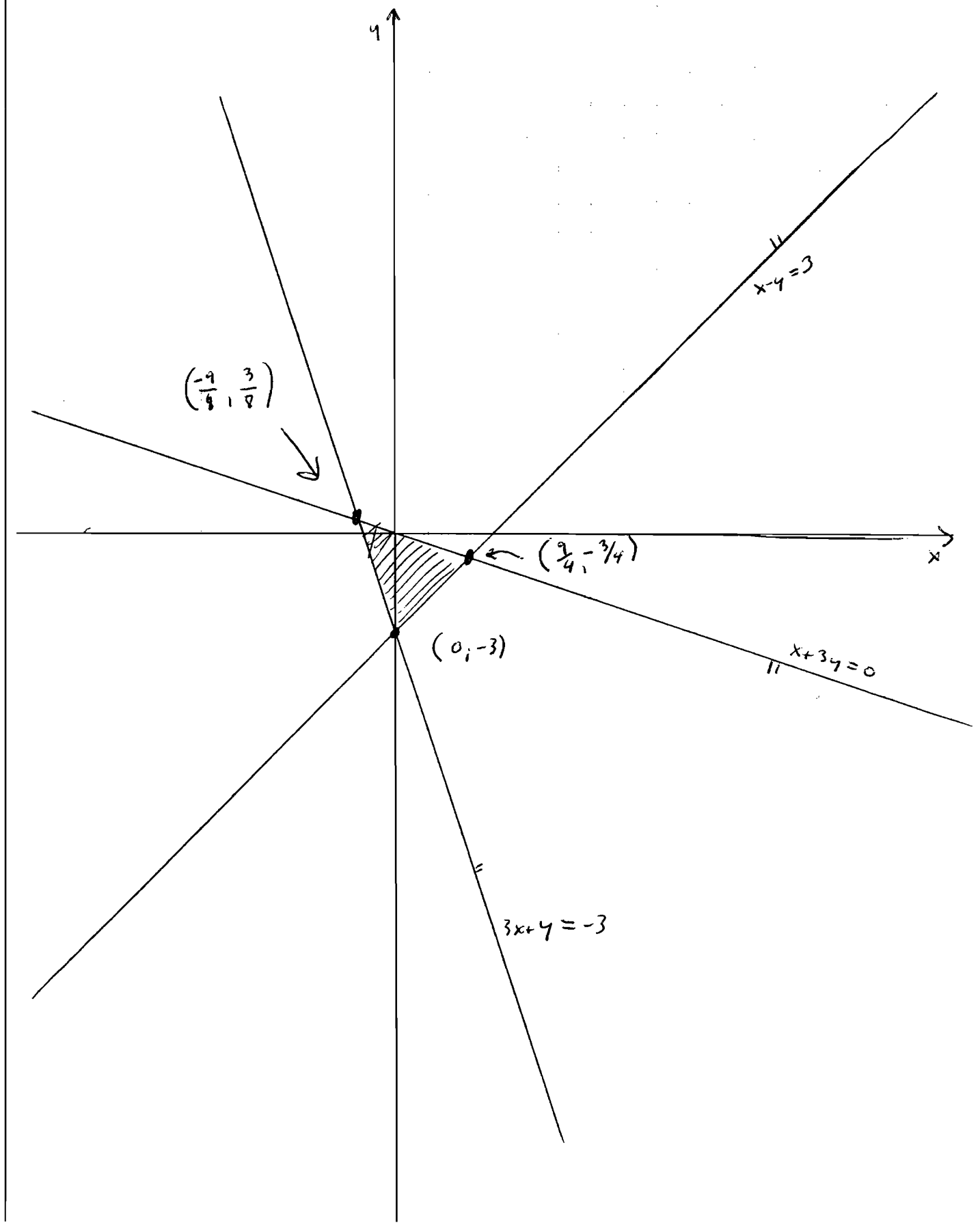


x	y	200x + 250y
5	30	8500
$\frac{45}{2}$	$\frac{25}{2}$	7625

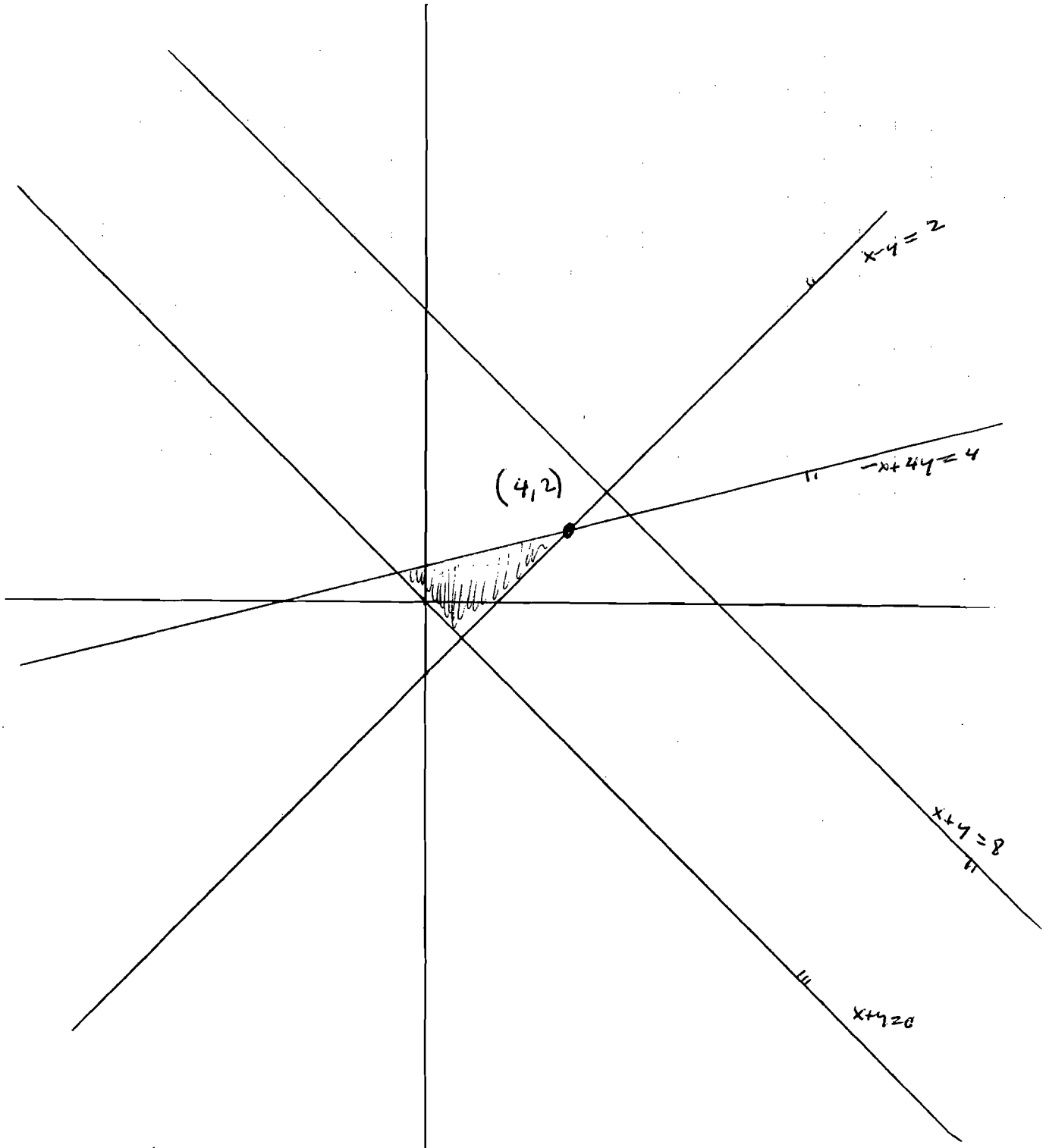
Max profit of 8500 $ at

5 LH Widgets, 30 RH widgets

Problem 19

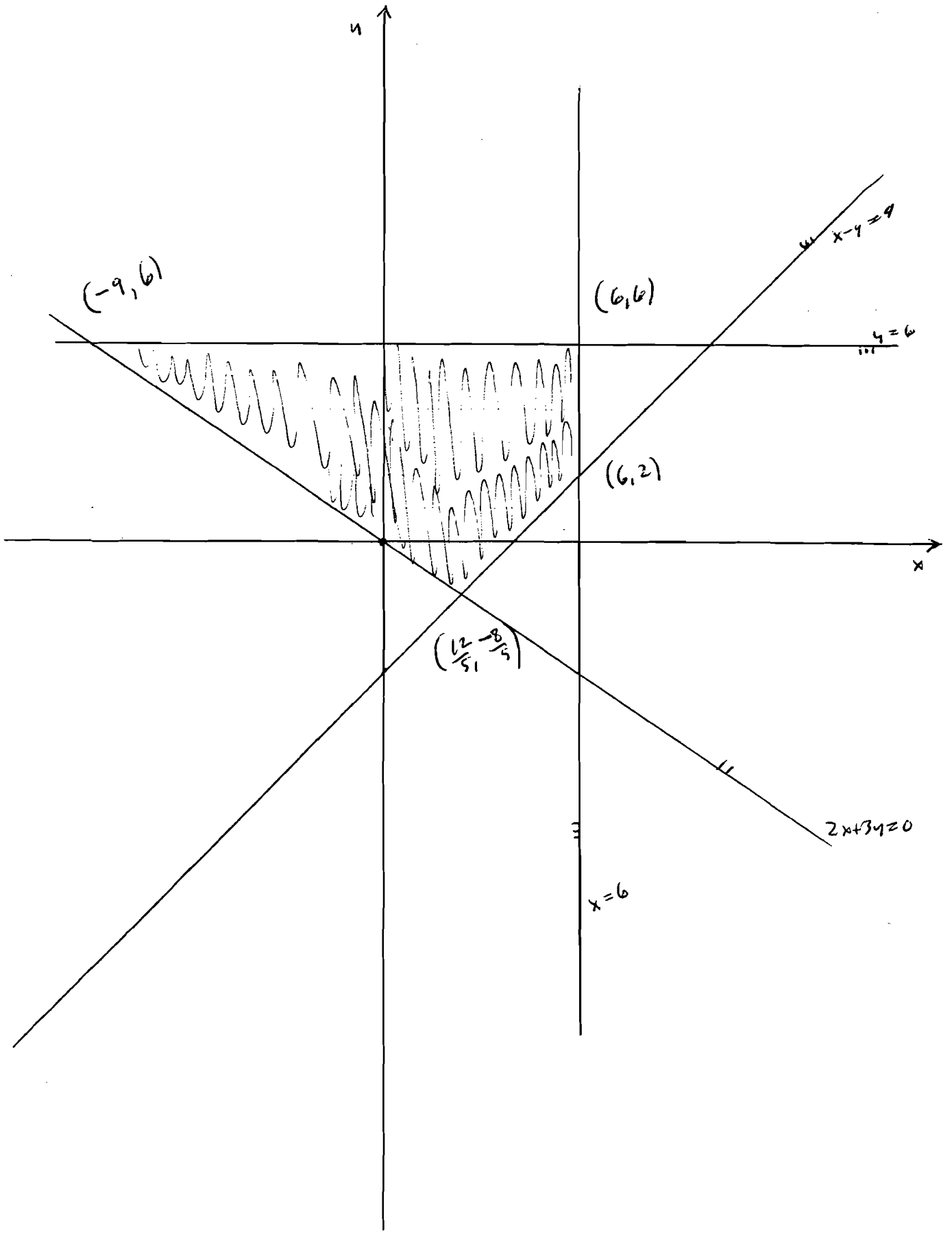

y
x
x-y=3
$\left(\frac{-9}{8}, \frac{3}{8}\right)$
$\left(\frac{9}{4}, -\frac{3}{4}\right)$
(0, -3)
x+3y=0
3x+y=-3

Problem 20



x-coord of corner is 4

Problem
21



oblem

21, cut

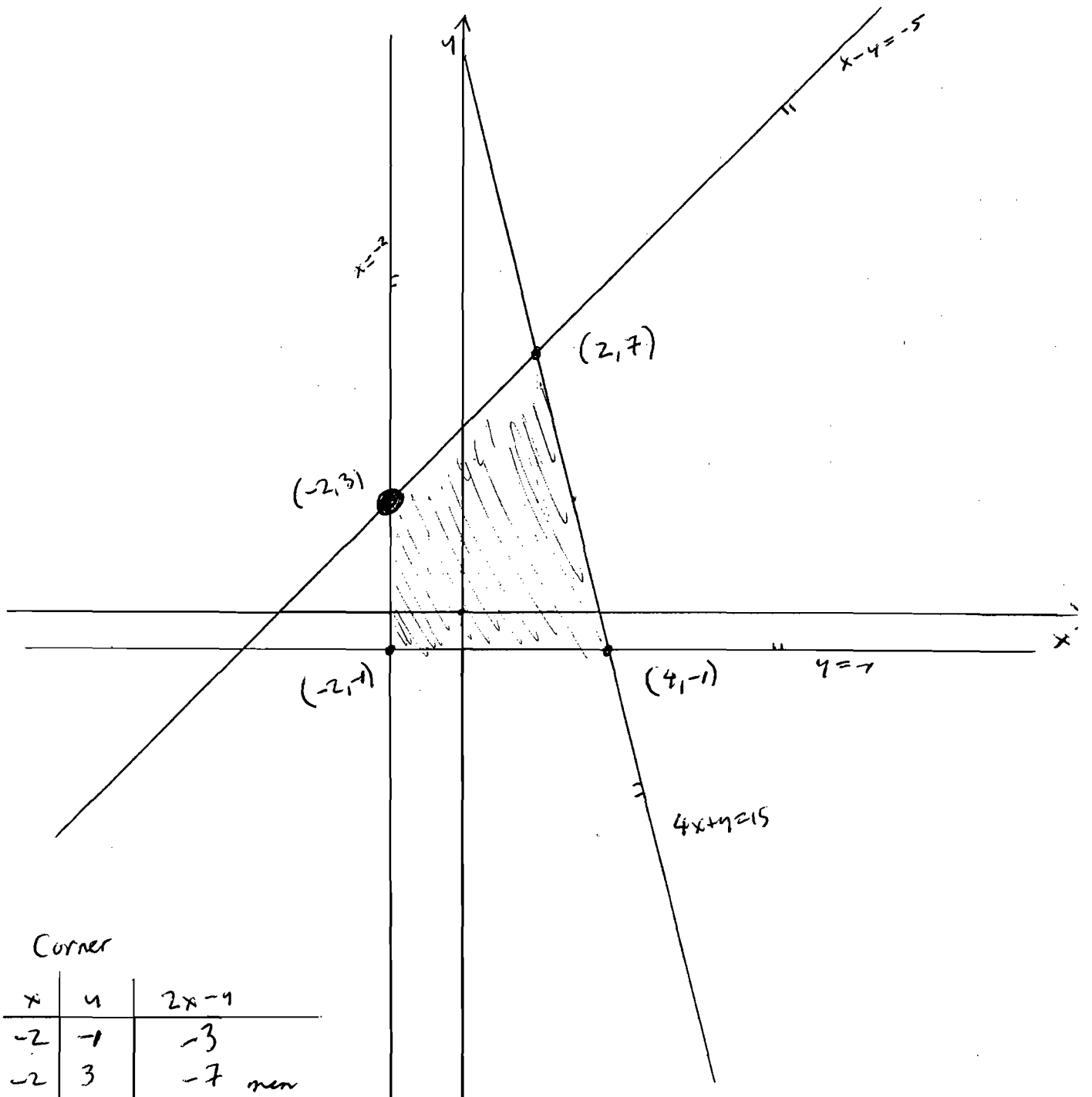
Corner pt

x	y	2x−5y
−9	6	−48
6	6	−18
6	2	2
$\frac{12}{5}$	$-\frac{8}{5}$	$\frac{64}{5} = 12\frac{1}{5}$ Max

Max $\frac{64}{5}$ is reached at

$x = \frac{12}{5}$, $y = -\frac{8}{5}$

Problem 22



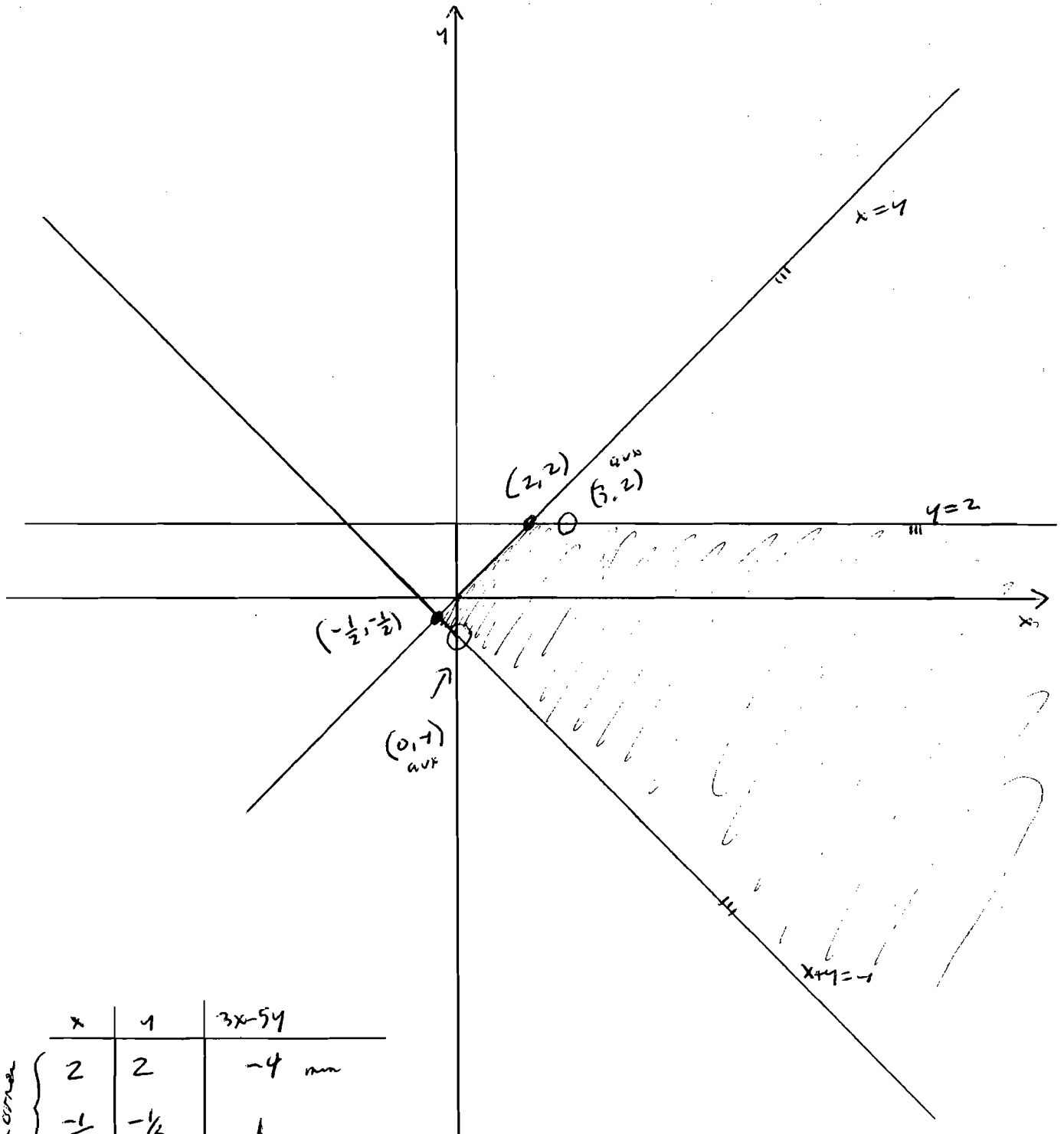
Corner

x	y	2x-y	
-2	-1	-3	
-2	3	-7	min
2	7	3	
4	-1	9	

Min -7 reached at

$x=-2, y=3$

Problem 23



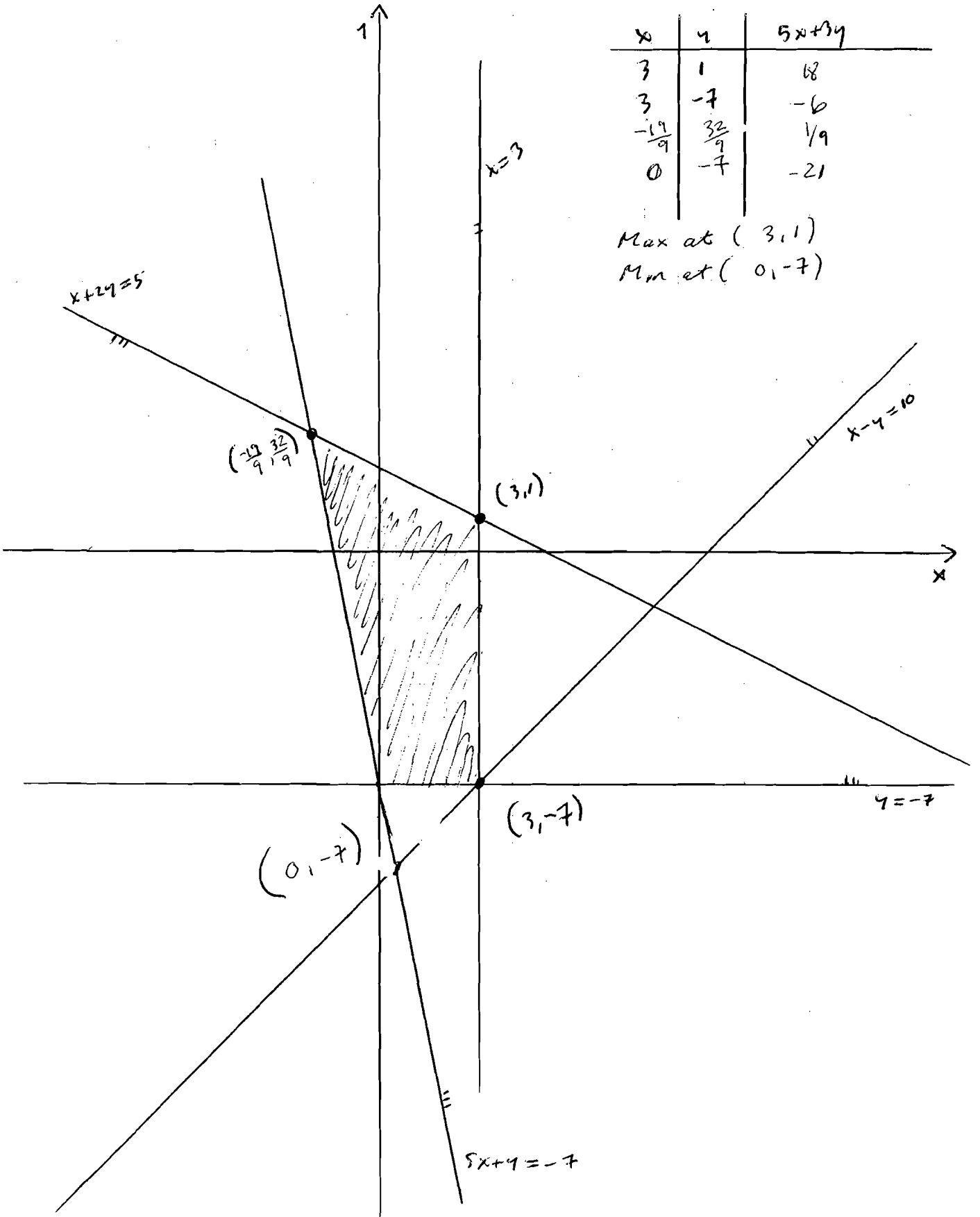
	x	y	3x−5y	
Corner	2	2	−4	min
Corner	$-\frac{1}{2}$	$-\frac{1}{2}$	1	
Aux	3	2	−1	
Aux	0	−1	5	max

Min −4 at (2,2)

No max

Problem

24



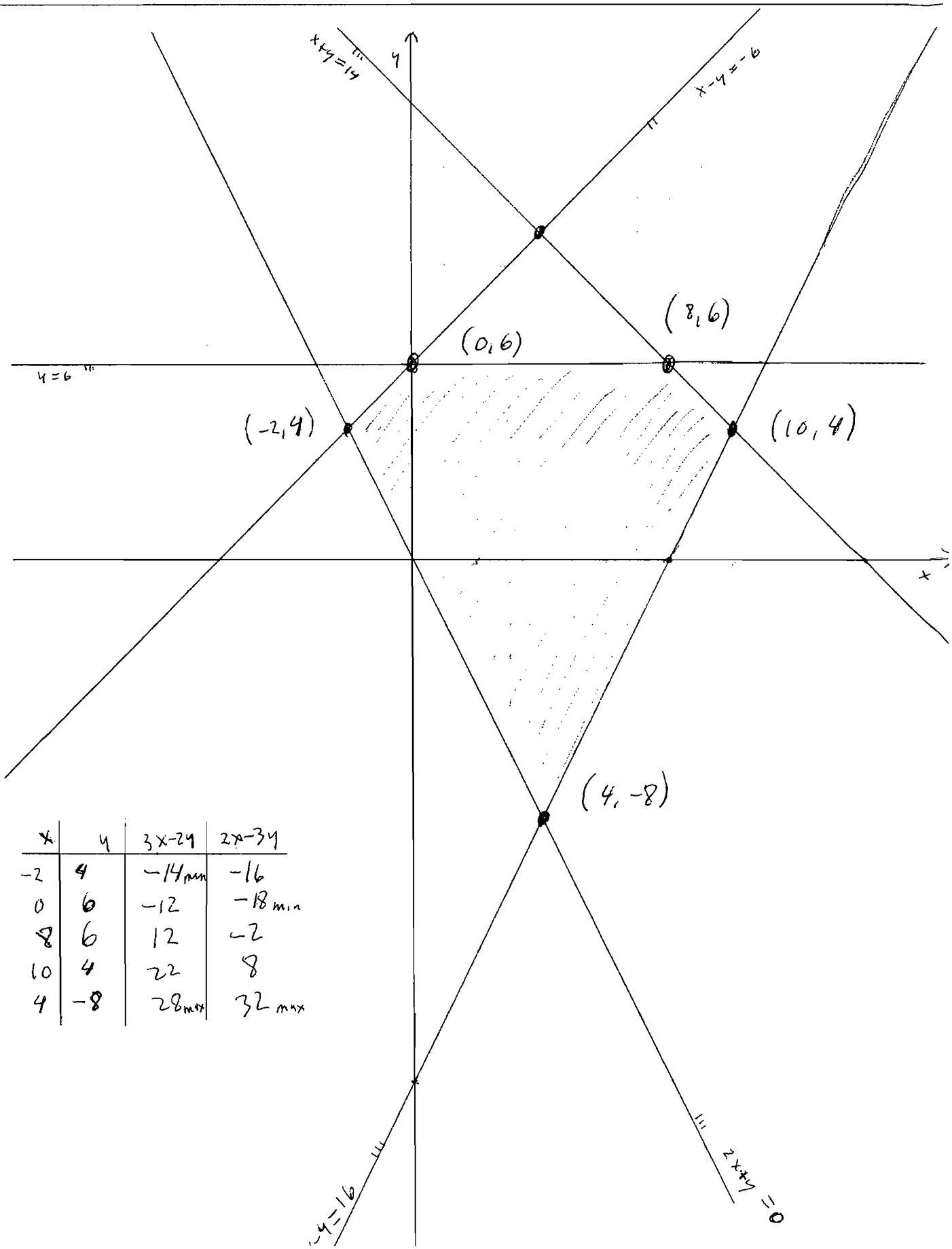
x	y	5x+3y
3	1	18
3	-7	-6
$-\frac{19}{9}$	$\frac{32}{9}$	1/9
0	-7	-21

Max at (3, 1)

Min at (0, -7)

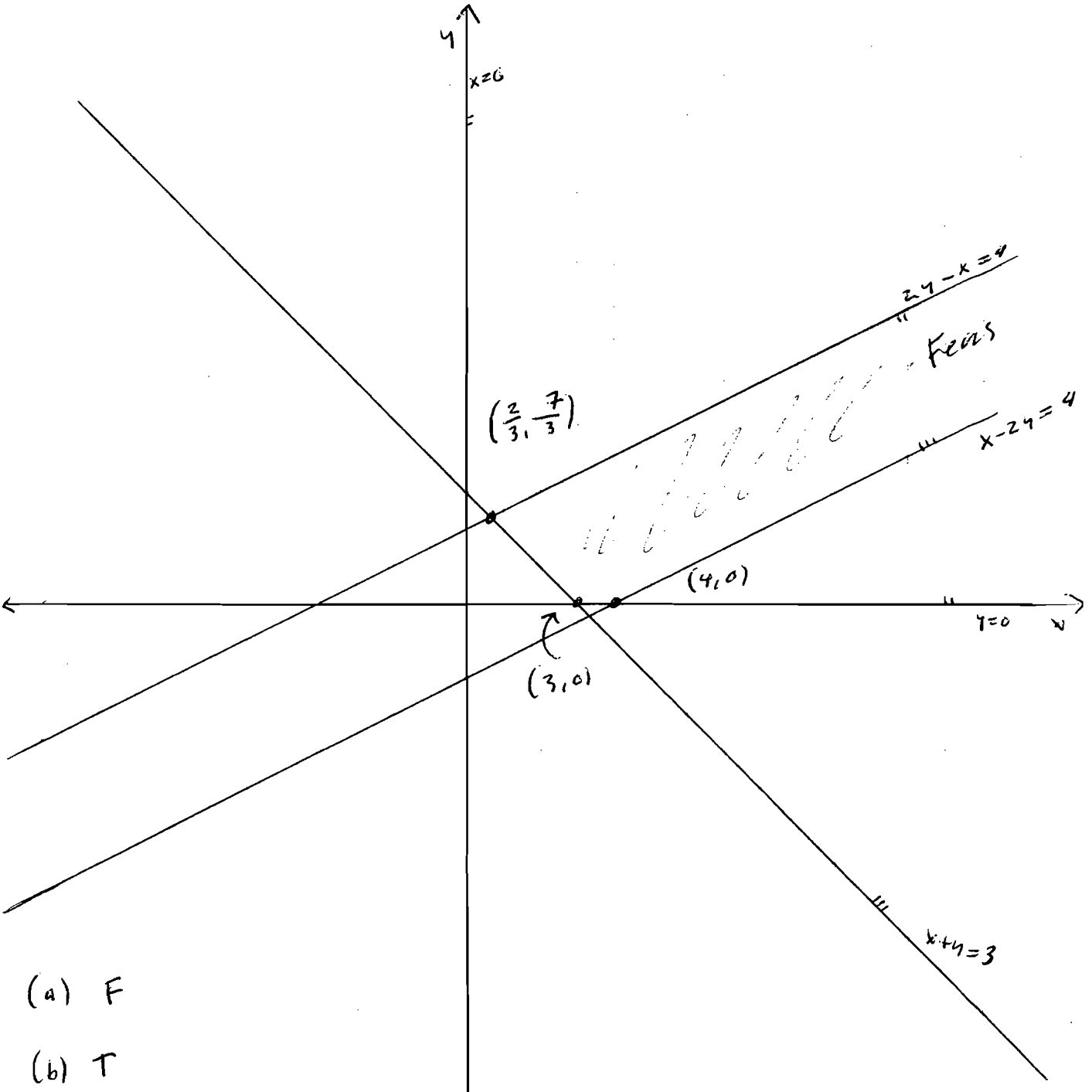
Problem

25



x	y	3x-2y	2x-3y
-2	4	-14 min	-16
0	6	-12	-18 min
8	6	12	-2
10	4	22	8
4	-8	28 max	32 max

Problem 26



(a) F

(b) T

(c) F

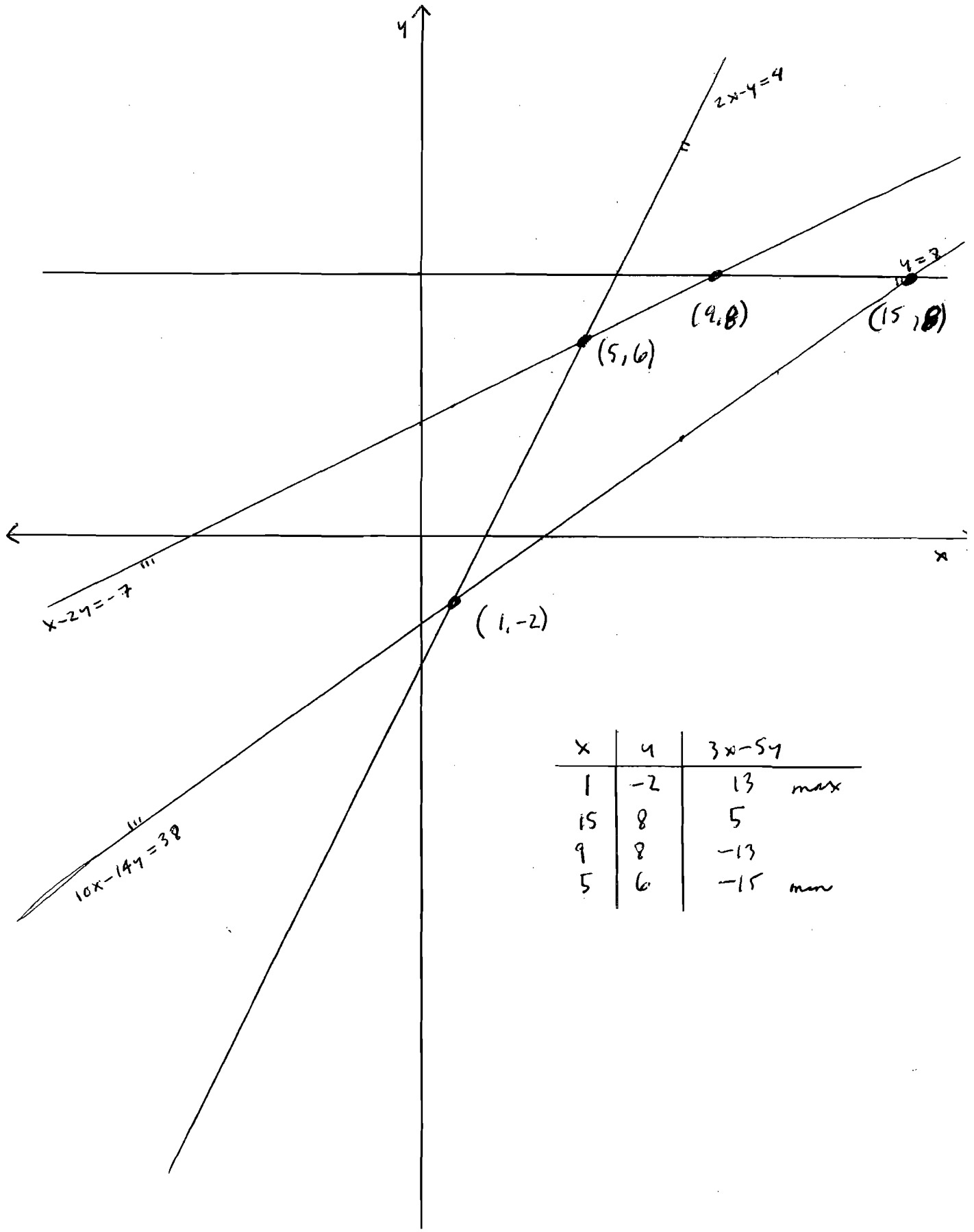
(d) F

7.R

29

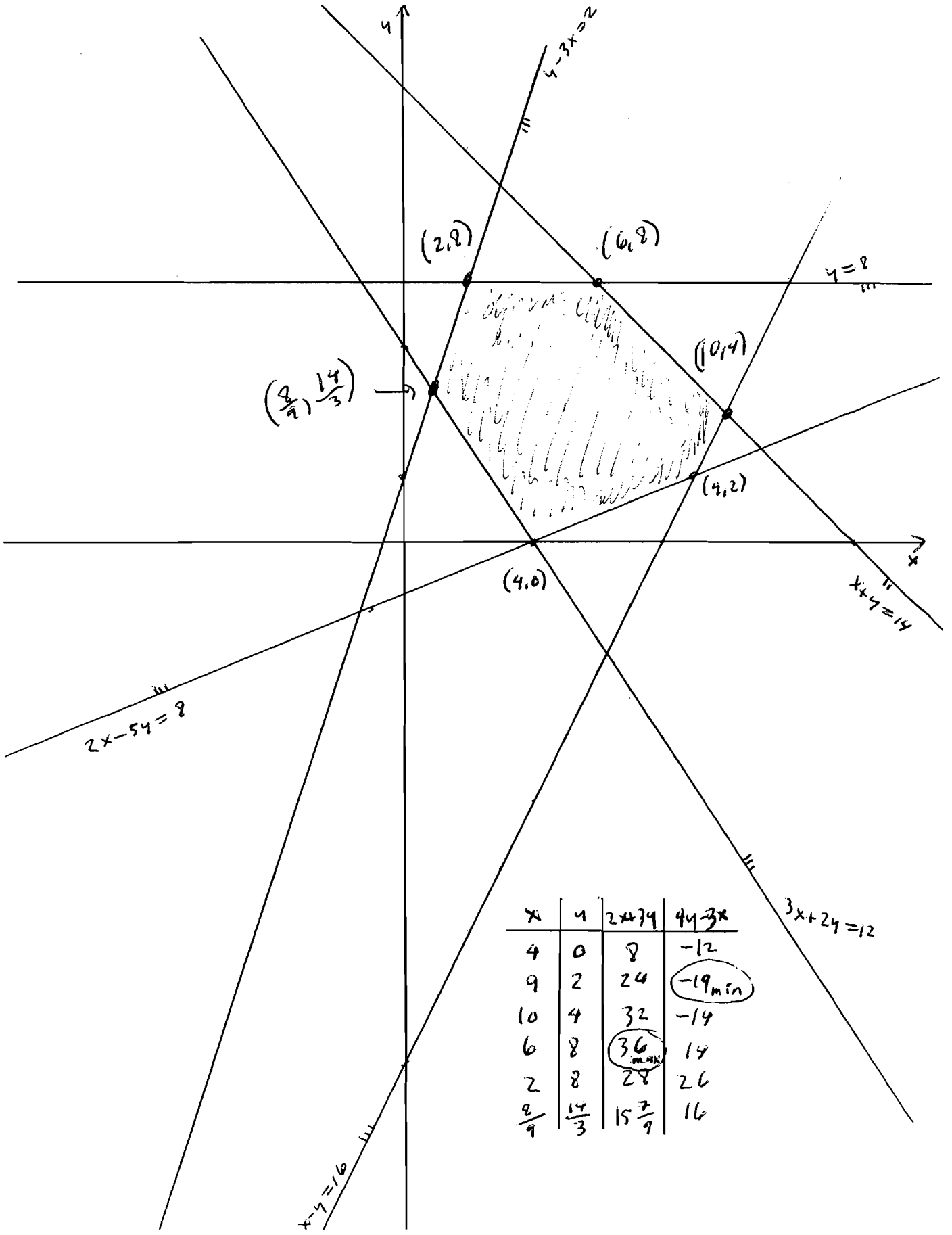
Problem

27



x	y	3x-5y	
1	-2	13	max
15	8	5	
9	8	-13	
5	6	-15	min

Problem 28

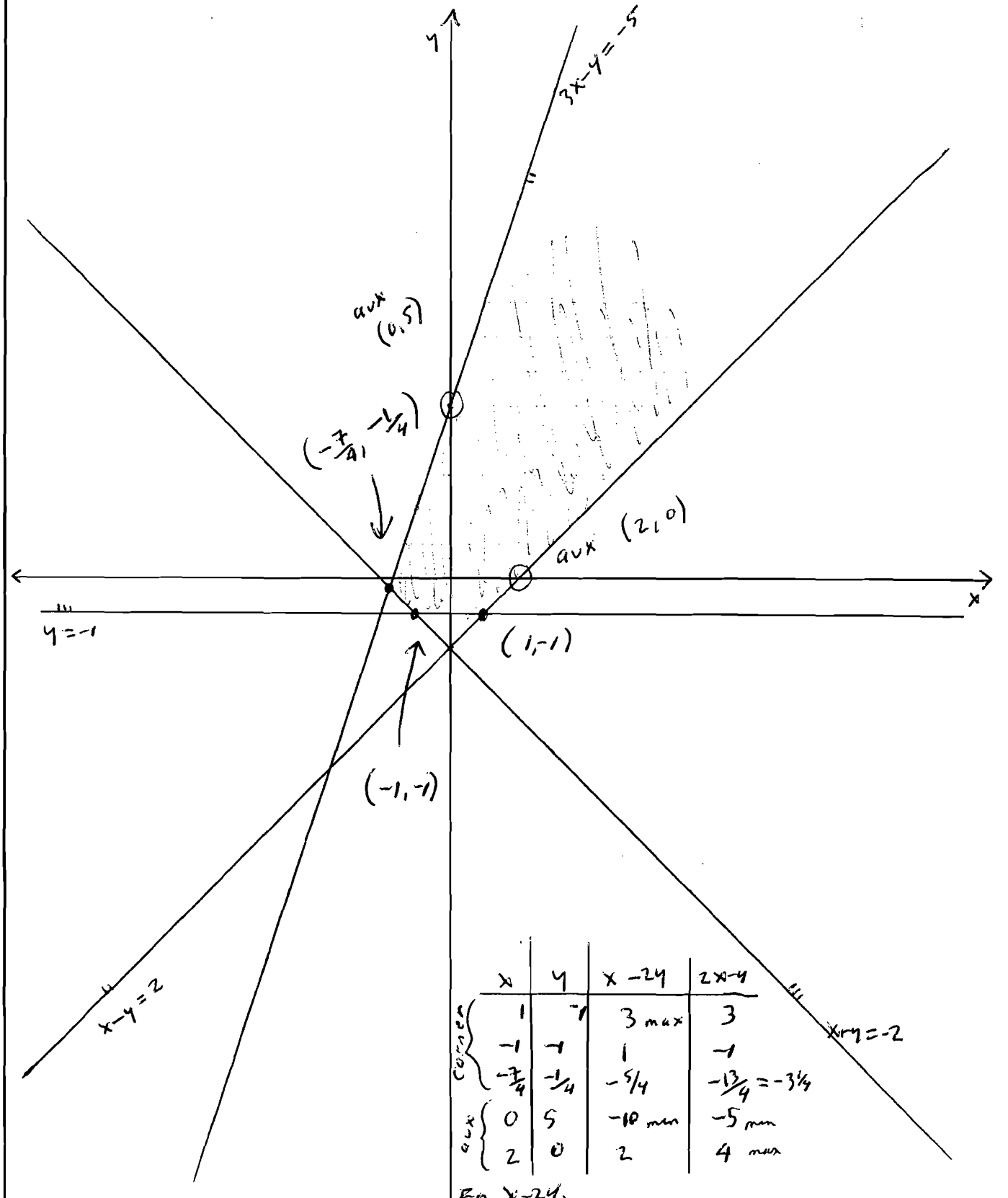


x	y	2x+7y	4y-3x
4	0	8	-12
9	2	24	-19 min
10	4	32	-14
6	8	36 max	14
2	8	28	26
8/9	14/3	15 7/9	16

Problem

29

30



	x	y	x − 2y	2x − y
corners	1	−1	3 max	3
	−1	−1	1	−1
	$-\frac{7}{4}$	$-\frac{1}{4}$	$-5/4$	$-\frac{13}{4} = -3\frac{1}{4}$
aux	0	5	−10 min	−5 min
aux	2	0	2	4 max

For x − 2y,
Max val 3 at (1,−1)
No Min
For 2x − y No Max No Min

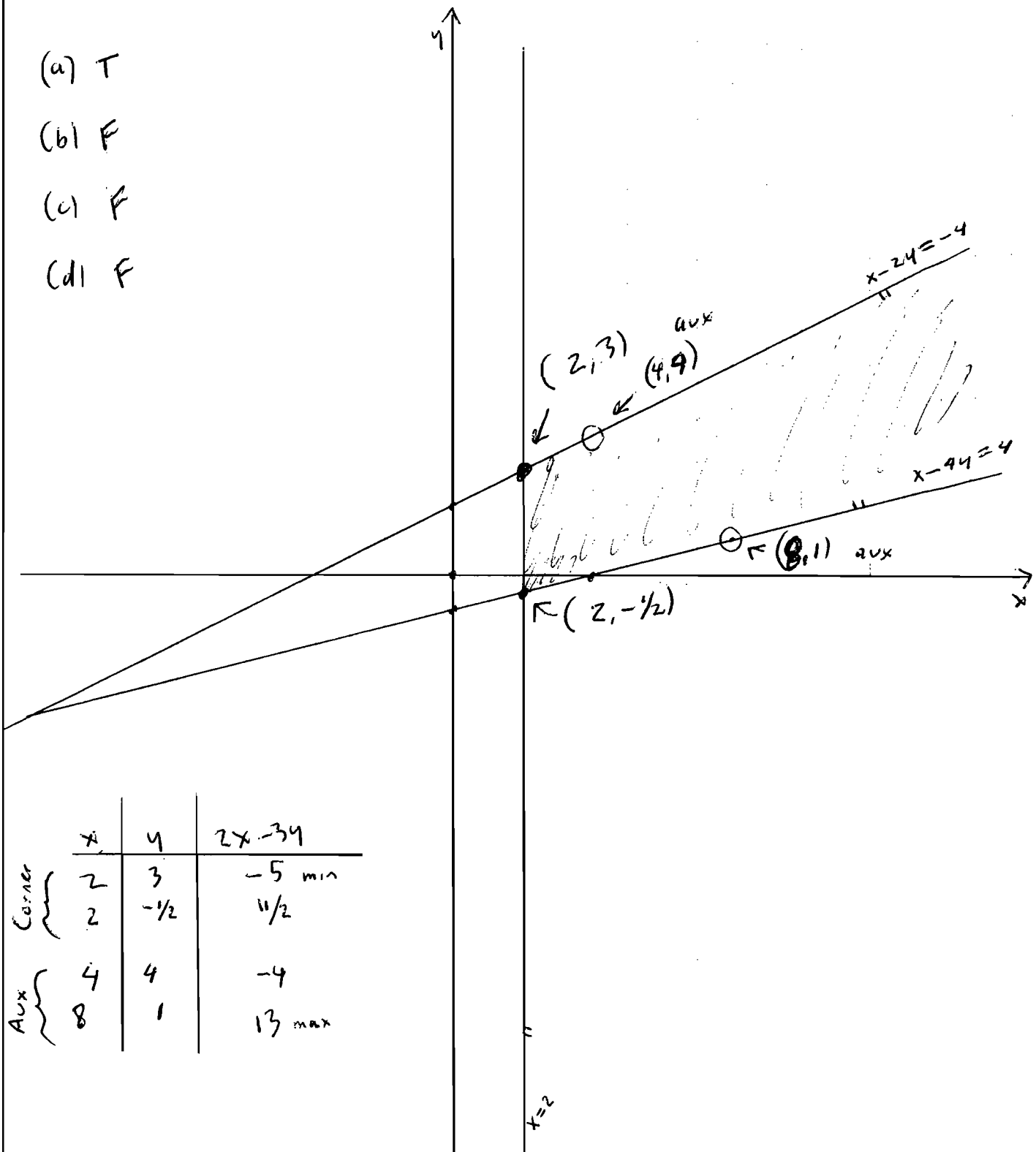
Problem 31

(a) T

(b) F

(c) F

(d) F



	x	y	2x-3y
Corner	2	3	-5 min
	2	-½	11/2
Aux	4	4	-4
	8	1	13 max

Problem

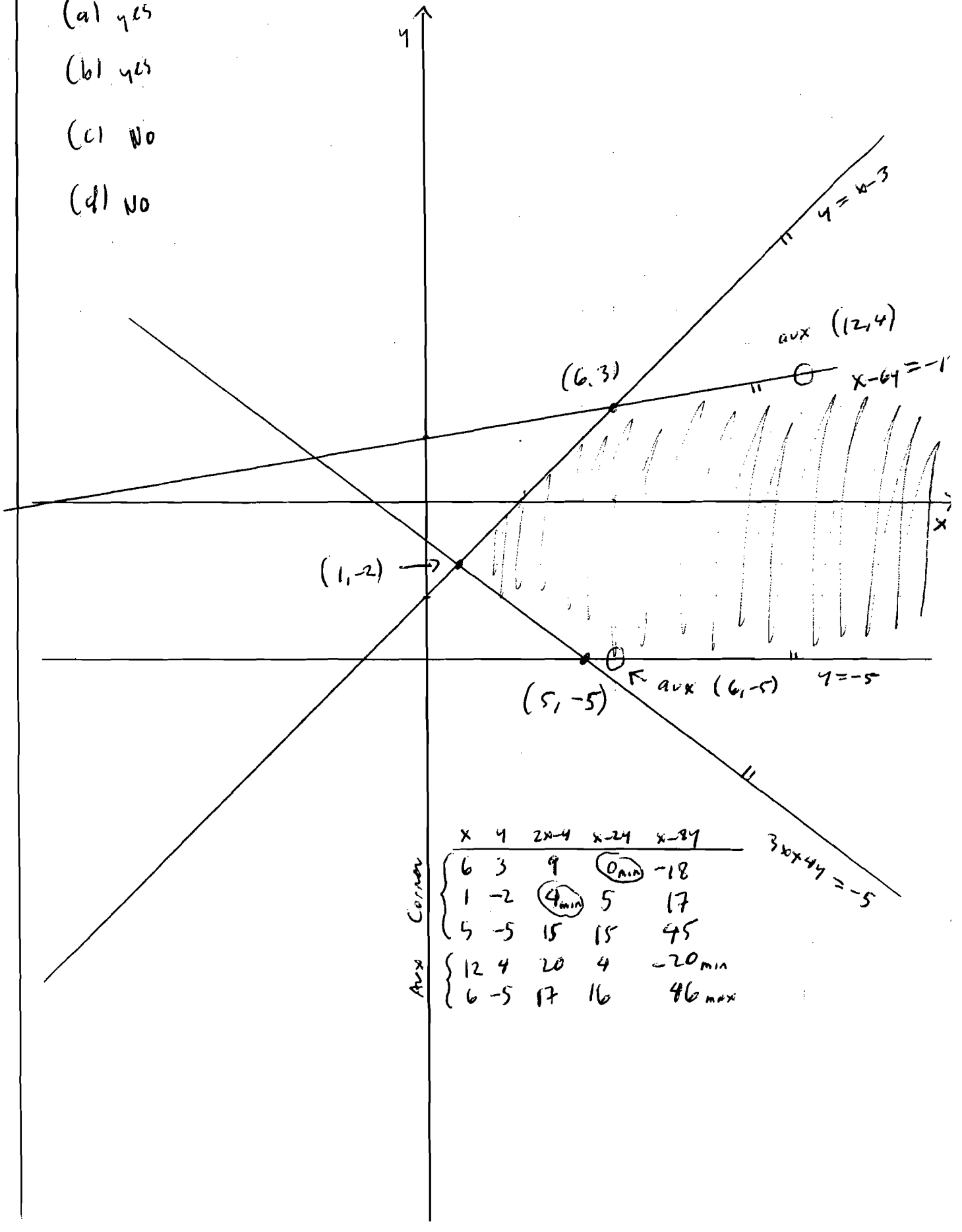
32

(a) yes

(b) yes

(c) No

(d) No



	x	y	2x-y	x-2y	x-8y	
Corner	6	3	9	0 min	-18	
	1	-2	4 min	5	17	
	5	-5	15	15	45	
Aux	12	4	20	4	-20 min	
	6	-5	17	16	46 max	