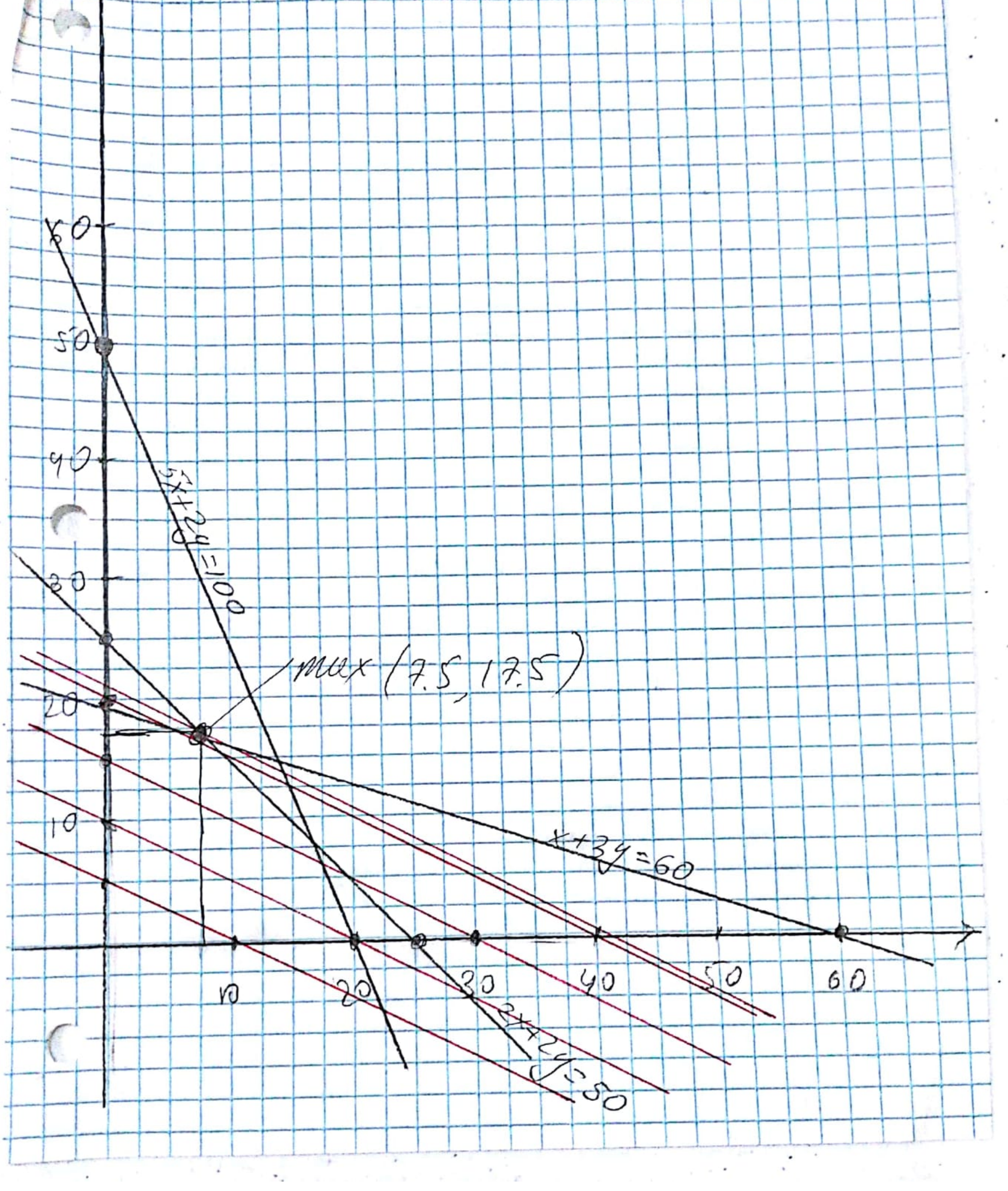
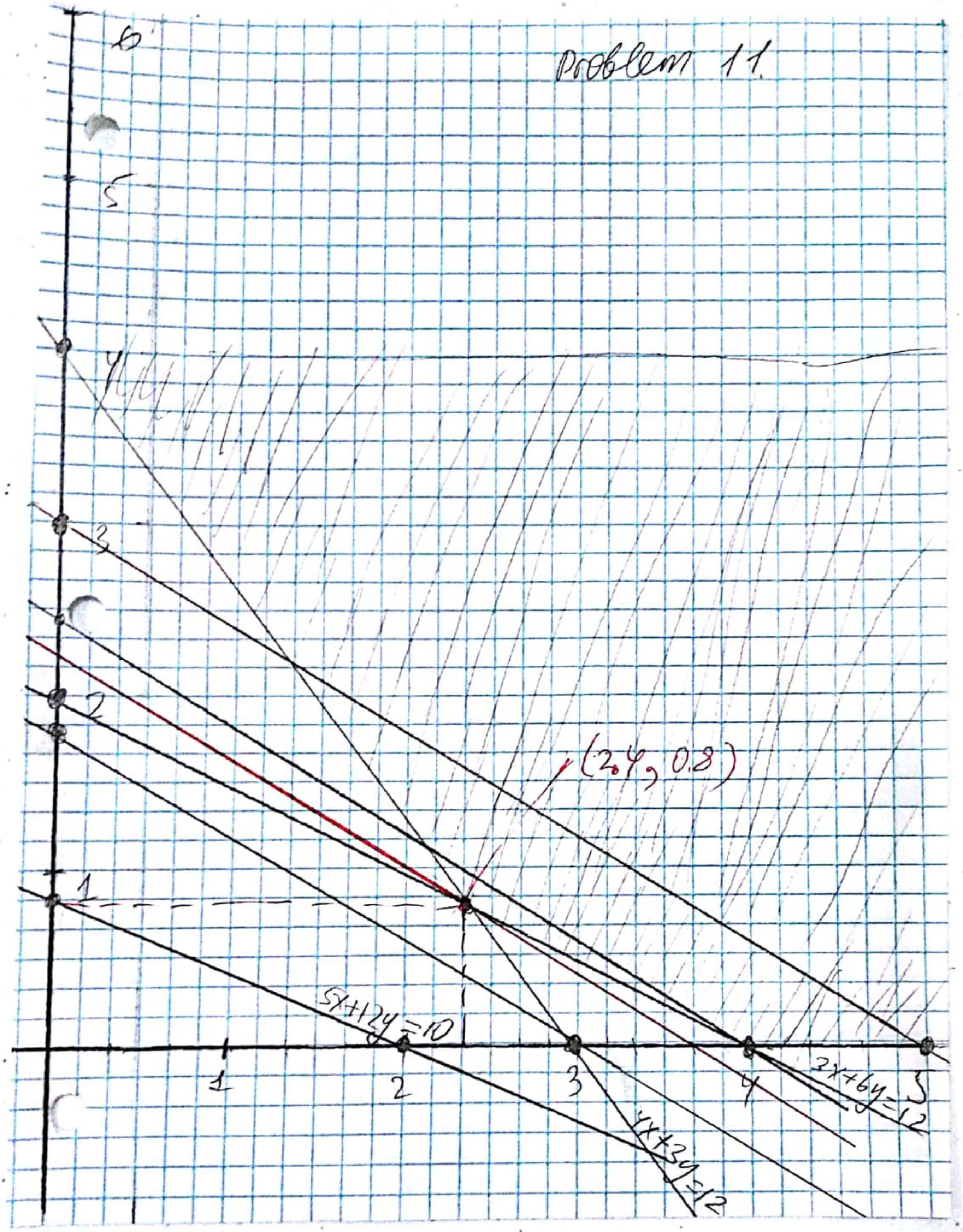
Problem 10



60
50
40
30
20
10
5x+2y=100
max (7.5, 17.5)
x+3y=60
2x+2y=50
10
20
30
40
50
60

Problem 11.



Problem $\underline{10}$ Simplex method.

$5x+2y \le 100$

$x+3y \le 60$

$2x+2y \le 50$

$x \ge 0, y \ge 0$

Objective: $p = x+2y$

Step: 1

$$\begin{cases} 5x+2y+S_1 = 100 \\ x+3y+S_2 = 60 \\ x+y+S_3 = 25 \\ -x-2y+p = 0 \\ x \ge 0, y \ge 0, S_1 \ge 0, S_2 \ge 0, S_3 \ge 0 \end{cases}$$

Step 1 find pivot

x	y	S_1	S_2	S_3	p	
-1	$\boxed{-2}$	0	0	0	1	0
1	1	0	0	1	0	25
1	3	0	1	0	0	60
5	2	1	0	0	0	100

$25/1 = 25$

$60/3 = 20$

$100/2 = 50$

$\min(25, 20, 50) = 20 \Rightarrow$ pivot $= 3$

pivot $= 3$

Step 2

x	y	S_1	S_2	S_3	P	
-1	-2	0	0	0	1	0
1	1	0	0	1	0	25
1/3	1	0	1/3	0	0	20
5	2	1	0	0	0	100

New pivot row

Step 3

x	y	S1	S2	S3	P	
$\boxed{-1/3}$	0	0	2/3	0	1	40
-2/3	0	0	1/3	0	0	-5
1/3	1	0	1/3	0	0	20
13/3	0	1	-2/3	0	0	60

Indicator row:

$\{-\frac{1}{3}, 0, 0, \frac{2}{3}, 0, 1\}$ not all ≥ 0, $\exists \left(-\frac{1}{3}\right) < 0$

$\frac{-5}{-2/3} = \frac{15}{2} = 7.5$

$20/\tfrac{1}{3} = 60$

$60/\tfrac{13}{3} = \frac{180}{13} = 13.84$

$\min(7.5, 60, 13.84) = 7.5 \Rightarrow -\frac{2}{3}$ is pivot

pivot

Step 4

Step 2:

x	y	S1	S2	S3	P	
-1/3	0	0	2/3	0	1	40
1	0	0	-1/2	0	0	$\frac{15}{2}$
$\frac{1}{3}$	1	0	$\frac{1}{3}$	0	0	20
$\frac{13}{3}$	0	1	$-\frac{2}{3}$	0	0	60

$\Downarrow$

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Step 5

x	y	S1	S2	S3	P	
0	0	0	$\frac{1}{2}$	0	1	42.5
1	0	0	$-\frac{1}{2}$	0	0	7.5
0	1	0	$\frac{1}{2}$	0	0	17.5
0	0	1	$-\frac{17}{6}$	0	0	32.5

max

→ indicators are: $\{0, 0, 0, \frac{1}{2}, 0, 1\} \geq 0$

All indicators are more or equal zero

=> Step 5 is the last step of the Simplex Method and step 5 is FINAL TABLEAU

$\begin{cases} 42.5 \text{ is maximum objective found} \\ x = 7.5 \\ y = 17.5 \end{cases}$

Because our solution is integer solution we have to round the value x and y and check the constraints

$x = 8$ $\quad$ $x = 8$ $\quad$ $x + 3y \leq 60$

$y = 17$ $\quad$ $y = 18$

$8 + 3 \cdot 17 = 59 \leq 60$

$8 + 3 \cdot 18 = 62 \geq 60$ does not satisfy the constraint

=> that the solution is

$x = 8$, $y = 17$, $MAX = 2 \cdot y + x = 2 \cdot 17 + 8 = \boxed{42}$