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Q1.) Wild west produces two types of cowboy hats. A type 1 hat requires three times as much labor time as type 2. if the all available labor time is dedicated to type 2 alone, the company can produce a total of 450 Type 2 hats a day. The market limits for the two types are 100 and 300 hats per day for Type 1 and Type 2 respectively. The profit is $8 per Type 1 hat and $5 per Type 2 hat. Determine the number of hats of each type that would maximize profit

i. Build the mathematical model of the problem
ii. Solve the problem graphically.

i.) Decision Variables:

$x_1 \rightarrow$ Type 1 hats
$x_2 \rightarrow$ Type 2 hats

Constraints:

$3x_1 + x_2 \leq 450 \rightarrow (1)$
$x_1 \leq 100 \rightarrow (2)$
$x_2 \leq 300 \rightarrow (3)$
$x_1, x_2 \geq 0 \rightarrow (4)$
$x_1, x_2 \in Z^+ \rightarrow (5)$

Objective function:

maximize $Z = 8x_1 + 5x_2$

ii.)

$8x_1 + 5x_2 = 400$

$x_1 = 50, \quad x_2 = 80$

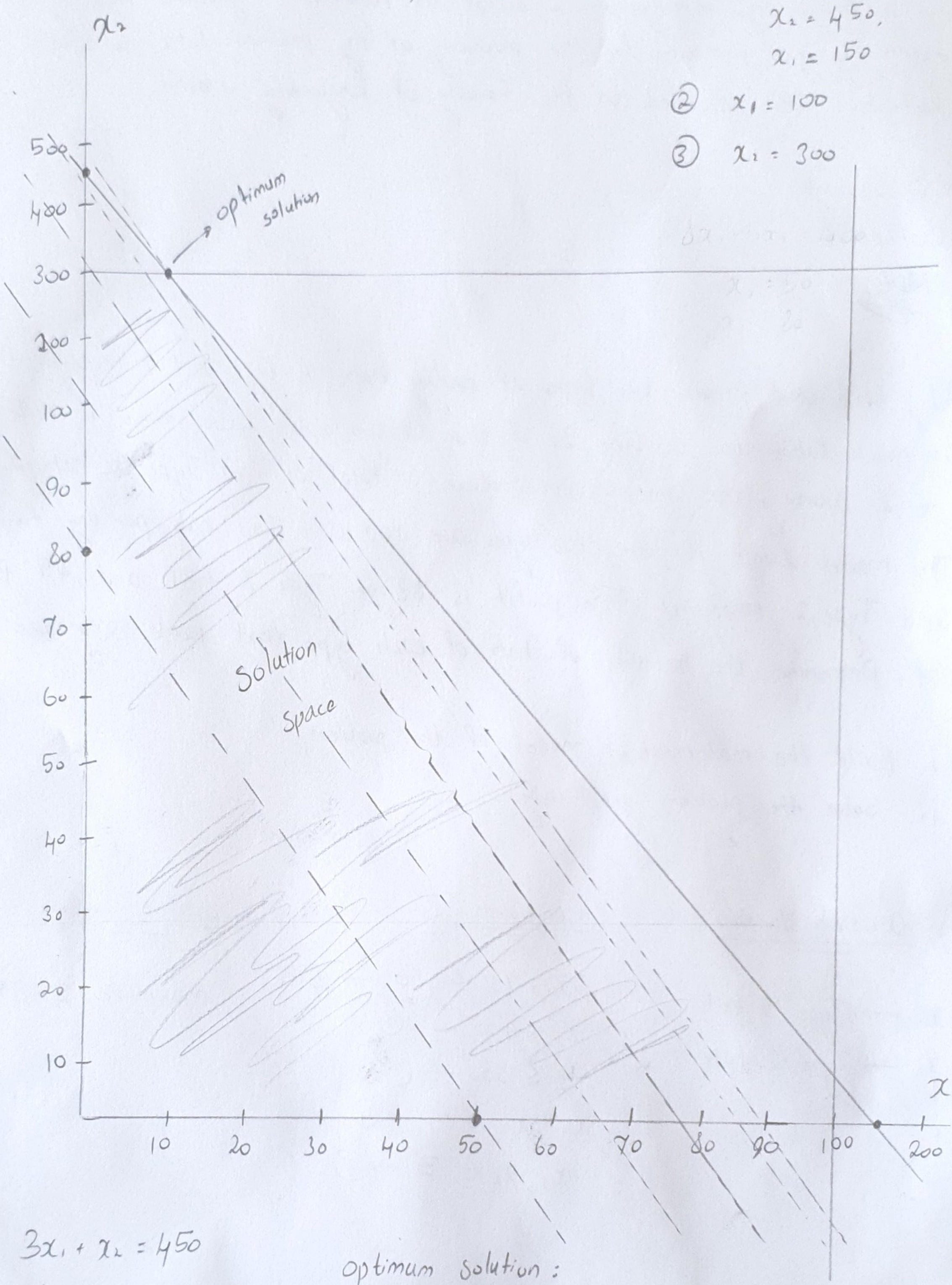
① $3x_1 + x_2 \leq 450$

$x_2 = 450,$

$x_1 = 150$

② $x_1 = 100$

③ $x_2 = 300$



$3x_1 + x_2 = 450$

$x_2 = 300$

$3x_1 + 300 = 450$

$3x_1 = 150$

$x_1 = 50$

optimum solution :

$x_1 = 50, \quad x_2 = 300$

$8x_1 + 5x_2$

$8 \times 50 + 5 \times 300 = \$1900$ profit