Optimization Methods - HW

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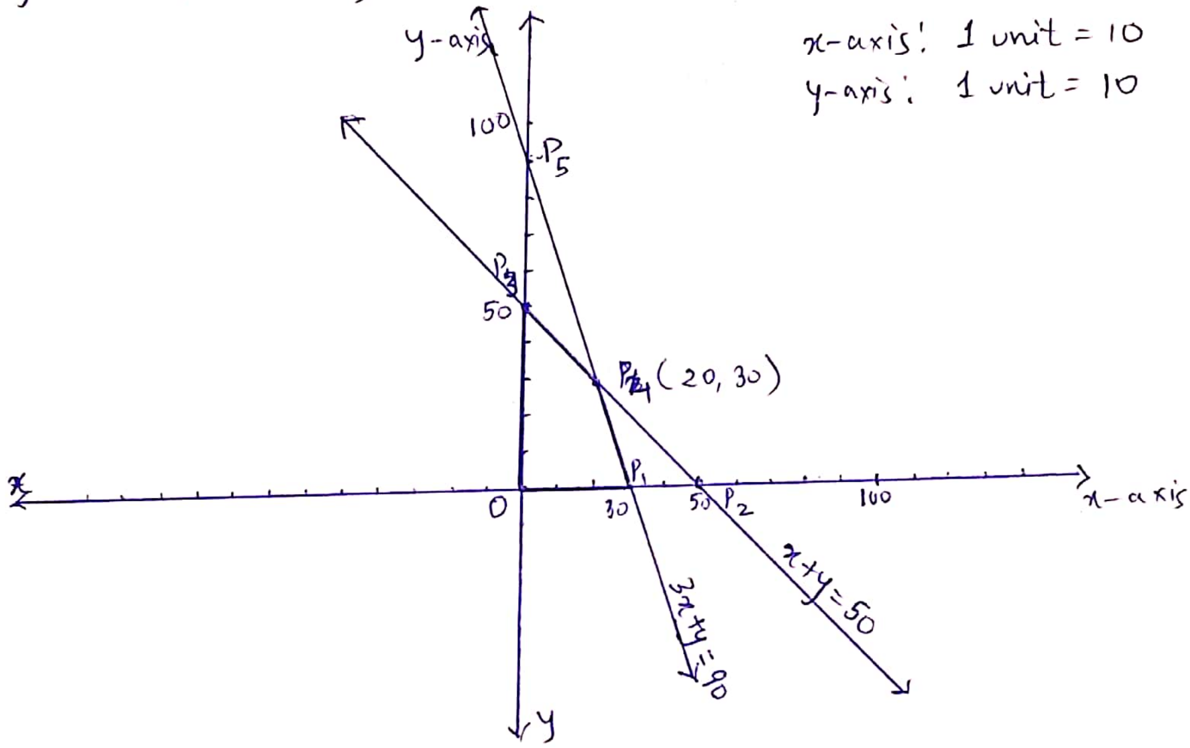
Ques: max $z = 4x + y$, subject to constraints -

$x + y \leq 50$, $3x + y \leq 90$, $x \geq 0$, $y \geq 0$

Solution:

x-axis: 1 unit = 10
y-axis: 1 unit = 10



- The points on the graph are - $P_1(30,0)$, $P_2(50,0)$, $P_3(0,50)$, $P_4(20,30)$, $P_5(0,90)$.
- Given the constraints $x \geq 0$, $y \geq 0$, the feasible region is the one formed by polygon $OP_1P_4P_3$.
- Assuming $x, y \in \mathbb{R}$, the problem of maximizing z is that of LP.
- Hence, z is maximum at one of the corners of the polygon $OP_1P_4P_3$.

At $O(0,0)$, $z = 4(0) + 0 = 0$

At $P_1(30,0)$, $z = 4 \cdot (30) + 0 = 120$

At $P_4(20,30)$, $z = 4(20) + 30 = 110$

At $P_3(0,50)$ $z = 4 \cdot (0) + 50 = 50$

Therefore, $z = 4x + y$ is maximum at $P_1(30,0)$.