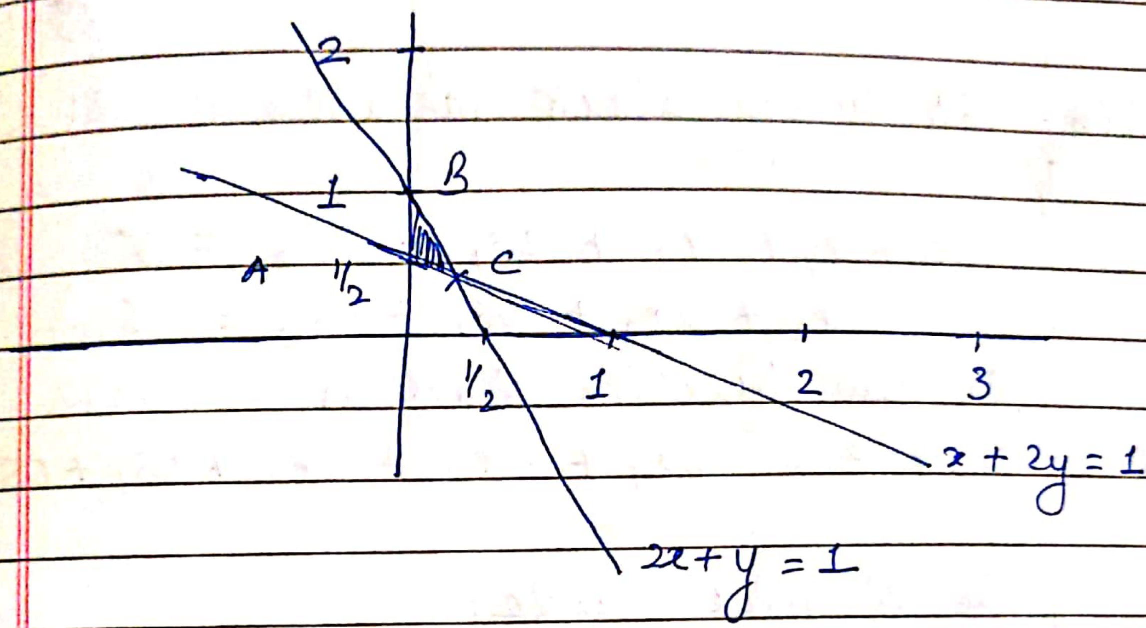
2016

(1) Max $Z = 5x + 2y$

s.t $x + 2y \geq 1$

$2x + y \leq 1$; $x, y \geq 0$



The shaded area represents the feasible region.

The points $A(0, 1/2)$, $B(0, 1)$ and $C(1/3, 1/3)$

$$Z\Big|_A = 2(1/2) = 1$$

$$Z\Big|_B = 2(1) = 2$$

$$Z\Big|_C = \frac{5}{3} + \frac{2}{3} = 7/3$$

So, Max $Z = 7/3$

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② Max $z = 2x_1 + 3x_2 + 6x_3$

s.t $2x_1 + x_2 + x_3 \le 5$

$3x_2 + 2x_3 \le 6$; $x_i \geq 0$

Is the solution unique? Justify.

Soln: Introducing slack variables:

$2x_1 + x_2 + x_3 + 1S_1 + 0S_2 = 5$

$3x_2 + 2x_3 + 0S_1 + 1S_2 = 6$

The new objective function:

Max $z = 2x_1 + 3x_2 + 6x_3 + 0S_1 + 0S_2$

The simplex table:

	C_j	2	3	6	0	0		
X_B	C_B	x_1	x_2	x_3	S_1	S_2	b_i	Ratio
S_1	0	2	1	1	1	0	5	5
S_2	0	0	3	2	0	1	6	3
$Z_j - C_j$		-2	-3	-6	0	0		

	C_j	2	3	6	0	0		
X_B	C_B	x_1	x_2	x_3	S_1	S_2	b_i	Ratio
S_1	0	2	$-1/2$	0	1	$-1/2$	2	1
x_3	6	0	$3/2$	1	0	$1/2$	3	—
$Z_j - C_j$		-2	6	0	0	3		

		2	3	6	0	0	
X_B	C_B	x_1	x_2	x_3	S_1	S_2	b_i
x_1	2	1	$-1/4$	0	$1/2$	$-1/4$	1
x_3	6	0	$3/2$	1	0	$1/2$	3
$Z_j - C_j$		0	$11/2$	0	1	$5/2$	

$\because$ all $z_j - c_j \geq 0$

$\Rightarrow$ It is an optimised table.

Also, $z_j - c_j = 0$ only for the basis variables $\Rightarrow$ Unique solution.

The solution is :

$x_1 = 1$

$x_3 = 3$

So,

Max $Z = 2(1) + 3(0) + 6(3)$

$= \underline{20}$

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