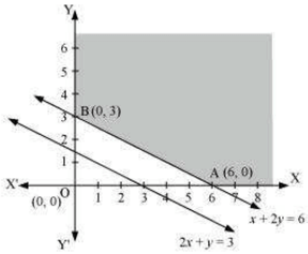
The feasible region determined by the constraints, $2x + y \geq 3$, $x + 2y \geq 6$, $x \geq 0$, and $y \geq 0$, is as follows.



The corner points of the feasible region are A (6, 0) and B (0, 3).
The values of Z at these corner points are as follows.

Corner point	**Z = x + 2y**
A(6, 0)	6
B(0, 3)	6

It can be seen that the value of Z at points A and B is same. If we take any other point such as (2, 2) on line $x + 2y = 6$, then Z = 6

Thus, the minimum value of Z occurs for more than 2 points.

Therefore, the value of Z is minimum at every point on the line, $x + 2y = 6$

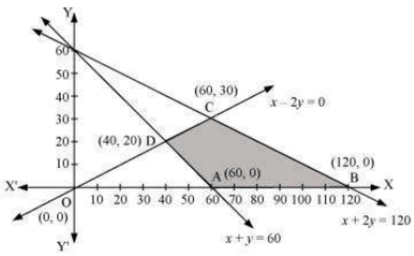
Question 7:

Minimise and Maximise Z = 5x + 10y

subject to $x+2y\leq 120, x+y\geq 60, x-2y\geq 0, x, y\geq 0$.

Answer

The feasible region determined by the constraints, $x + 2y \leq 120$, $x + y \geq 60$, $x - 2y \geq 0$, $x \geq 0$, and $y \geq 0$, is as follows.



The corner points of the feasible region are A (60, 0), B (120, 0), C (60, 30), and D (40, 20).

The values of Z at these corner points are as follows.

Corner point	**Z = 5x + 10y**	
A(60, 0)	300	→ Minimum
B(120, 0)	600	→ Maximum
C(60, 30)	600	→ Maximum
D(40, 20)	400	

The minimum value of Z is 300 at (60, 0) and the maximum value of Z is 600 at all the points on the line segment joining (120, 0) and (60, 30).

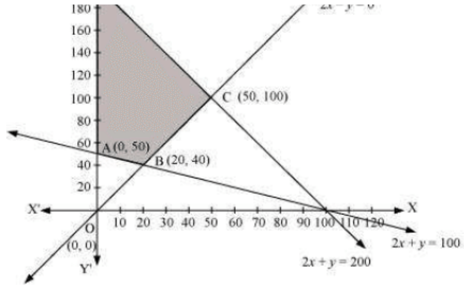
Question 8:

Minimise and Maximise Z = x + 2y

subject to $x+2y\geq 100,\ 2x-y\leq 0,\ 2x+y\leq 200;\ x, y\geq 0$.

Answer

The feasible region determined by the constraints, $x + 2y \geq 100$, $2x - y \leq 0$, $2x + y \leq 200$, $x \geq 0$, and $y \geq 0$, is as follows.



The corner points of the feasible region are A(0, 50), B(20, 40), C(50, 100), and D(0, 200).

The values of Z at these corner points are as follows.

Corner point	Z = x + 2y	
A(0, 50)	100	→ Minimum
B(20, 40)	100	→ Minimum
C(50, 100)	250	
D(0, 200)	400	→ Maximum

The maximum value of Z is 400 at (0, 200) and the minimum value of Z is 100 at all the points on the line segment joining the points (0, 50) and (20, 40).

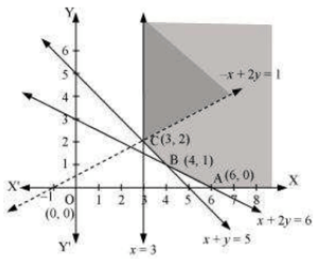
Question 9:

Maximise Z = − x + 2y, subject to the constraints:

$x \geq 3,\ x+y \geq 5,\ x+2y \geq 6,\ y \geq 0$.

Answer

The feasible region determined by the constraints, $x \geq 3,\ x+y \geq 5,\ x+2y \geq 6,$ and $y \geq 0,$ is as follows.



It can be seen that the feasible region is unbounded.

The values of Z at corner points A (6, 0), B (4, 1), and C (3, 2) are as follows.

Corner point	Z = −x + 2y
A(6, 0)	Z = − 6
B(4, 1)	Z = − 2
C(3, 2)	Z = 1

As the feasible region is unbounded, therefore, Z = 1 may or may not be the maximum value.

For this, we graph the inequality, −x + 2y > 1, and check whether the resulting half plane has points in common with the feasible region or not.

The resulting feasible region has points in common with the feasible region.

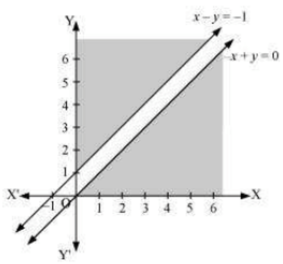
Therefore, Z = 1 is not the maximum value. Z has no maximum value.

Question 10:

Maximise Z = x + y, subject to $x - y \leq -1,\ -x + y \leq 0,\ x, y \geq 0$.

Answer

The region determined by the constraints, $x - y \leq -1,\ -x + y \leq 0,\ x, y \geq 0,$ is as follows.



There is no feasible region and thus, Z has no maximum value.

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