1. Solve the following linear programming problems graphically.

(i) *Max* $z = 5x_1 + 3x_2$, s/t $3x_1 + 5x_2 \leq 15$, $5x_1 + 2x_2 \leq 10$, $x_1, x_2 \geq 0$.

(ii) *Min* $z = 2x_1 + 3x_2$, s/t $x_1 + x_2 \leq 4$, $6x_1 + 2x_2 \geq 8$, $x_1 + 5x_2 \geq 4$, $x_1 \leq 3$, $x_2 \leq 3$, $x_1, x_2 \geq 0$.

(iii) *Max* $z = 2x_1 + 2x_2$, s/t $x_1 - x_2 \geq -1$, $-0.5x_1 + x_2 \leq 2$, $x_1, x_2 \geq 0$.

(iv) *Max* $z = -3x_1 + 2x_2$, s/t $x_1 - x_2 \leq 0$, $x_1 \leq 3$, $x_1, x_2 \geq 0$.

(v) *Max* $z = -x_1 + 2x_2$, s/t $x_1 - x_2 \geq -1$, $-0.5x_1 + x_2 \leq 2$, $x_1, x_2 \geq 0$.

(vi) *Max* $z = 3x_1 - 2x_2$, s/t $x_1 + x_2 \leq 1$, $2x_1 + 2x_2 \geq 4$, $x_1, x_2 \geq 0$.

(vii) *Max* $z = x_1 + x_2$, s/t $x_1 - x_2 \geq 0$, $3x_1 - x_2 \leq -3$, $x_1, x_2 \geq 0$.

2. Consider the following LPP
Max $z = -4x_1 + 6x_2$, s/t $2x_1 - 3x_2 \geq -6$, $-x_1 + x_2 \leq 1$, $x_1, x_2 \geq 0$.
Show graphically that the variables can be increased indefinitely while the optimal value of the objective function remains constant.

3. Linearize the following objective function:
$$\text{Max } z = \min \left\{ |2x_1 + 5x_2|, |7x_1 - 3x_2| \right\}$$

4. Write the standard form of the following LPP (do not solve the LPP)

(i) Max $Z = 2x_1 + x_2 + x_3$
s. t. $x_1 - x_2 + 2x_3 \geq 2$, $\qquad |2x_1 + x_2 - x_3| \leq 4$, $\qquad 3x_1 - 2x_2 - 7x_3 \leq 3$
$x_1, x_3 \geq 0$, $x_2 \leq 0$

(ii) Max $Z = x_1 + 2x_2 - x_3$
s. t. $x_1 + x_2 - x_3 \leq 5$, $-x_1 + 2x_2 + 3x_3 \geq -4$, $2x_1 + 3x_2 - 4x_3 \geq 3$, $x_1 + x_2 + x_3 = 2$,
$x_1 \geq 0$, $x_2 \geq p, x_3$ is unrestricted in sign.