Quiz 7

Express the LP in slack form:

$$\max z = 3(4x_1 + x_2)$$

$$\text{s. t. } x_3 = 4 + x_1 - 2x_2$$

$$x_4 = 12 - 2x_1 - 3x_2$$

$$x_5 = 3 - x_1 + 2x_2$$

$$x_1, x_2, x_3, x_4, x_5 \geq 0$$

The basic solution is (0,0,4,12,3), which is feasible for this problem. Then we use SIMPLEX algorithm to solve the LP. Starting with pivoting procedure, and let's first increase x_1, the new slack form can be substituted with $x_1 = 3 - x_5 + x_2$

$$\max z = 3(12 - 4x_5 + 5x_2)$$

$$\text{s. t. } x_3 = 7 - x_5 - x_2$$

$$x_4 = 6 + 2x_5 - 5x_2$$

$$x_1 = 3 - x_5 + x_2$$

$$x_1, x_2, x_3, x_4, x_5 \geq 0$$

Then we increase x_2 and substitute x_2 using $x_2 = \frac{6}{5} + \frac{2}{5}x_5 - \frac{1}{5}x_2$

$$\max z = 3(18 - 2x_5 - x_4)$$

$$\text{s. t. } x_3 = \frac{29}{5} - \frac{3x_5}{5} + \frac{x_4}{5}$$

$$x_2 = \frac{6}{5} + \frac{2x_5}{5} - \frac{x_4}{5}$$

$$x_1 = \frac{21}{5} - \frac{3x_5}{5} - \frac{x_4}{5}$$

$$x_1, x_2, x_3, x_4, x_5 \geq 0$$

Therefore, the final optimal solution is -54