

# EE5600 Assignment 3

Abhishek Thakur

**Abstract**—This document contains the solution of geometry through linear algebra through the concept of optimization.

Download latex and python codes from

[https://github.com/abhishekt711/EE5600/tree/master/Assignment\\_3](https://github.com/abhishekt711/EE5600/tree/master/Assignment_3)

## 1 PROBLEM

Maximize  $Z = 5x + 3y$  subject to  $3x + 5y \leq 15$ ,  
 $5x + 2y \leq 10$ ,  $x \geq 0$ ,  $y \geq 0$ .

## 2 EXPLANATION

$$Z - 5x - 3y = 0 \quad (2.0.1)$$

$$3x + 5y + s_1 = 15 \quad (2.0.2)$$

$$5x + 2y + s_2 = 10 \quad (2.0.3)$$

We will write the simplex tableau

$$\begin{array}{ccccc|c} x & y & s_1 & s_2 & c & \\ \hline 3 & 5 & 1 & 0 & 15 & \\ \boxed{5} & 2 & 0 & 1 & 10 & \\ \hline -5 & -3 & 0 & 0 & 0 & \end{array} \quad (2.0.4)$$

Keeping the pivot element as 5, we will use gauss-jordan elimination.

$$\begin{array}{ccccc|c} x & y & s_1 & s_2 & c & \\ \hline 0 & \boxed{\frac{19}{5}} & 1 & \frac{-3}{5} & 9 & \\ 1 & \frac{2}{5} & 0 & \frac{1}{5} & 2 & \\ \hline 0 & -1 & 0 & 1 & 10 & \end{array} \quad (2.0.5)$$

Keeping the pivot element as  $\frac{19}{5}$ , we will use gauss-jordan elimination.

$$\begin{array}{ccccc|c} x & y & s_1 & s_2 & c & \\ \hline 0 & 1 & \frac{5}{19} & \frac{-3}{19} & \frac{45}{19} & \\ 1 & 0 & \frac{-2}{19} & \frac{1}{19} & \frac{20}{19} & \\ \hline 0 & 0 & \frac{5}{19} & \frac{16}{19} & \frac{235}{19} & \end{array} \quad (2.0.6)$$

Using Simplex method, the maximum value of  $Z$  in the given constraint is  $\frac{235}{19}$ .

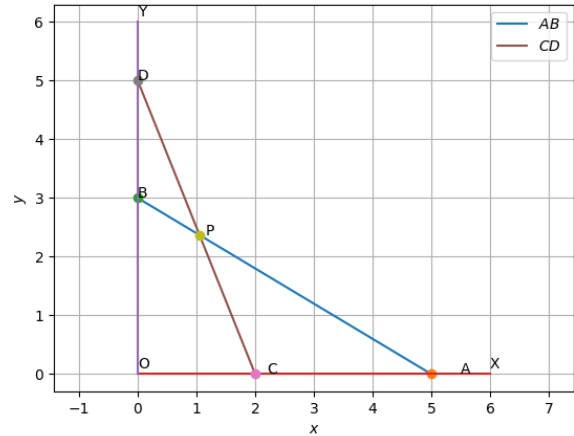


Fig. 0: optimal point through the intersection of various lines