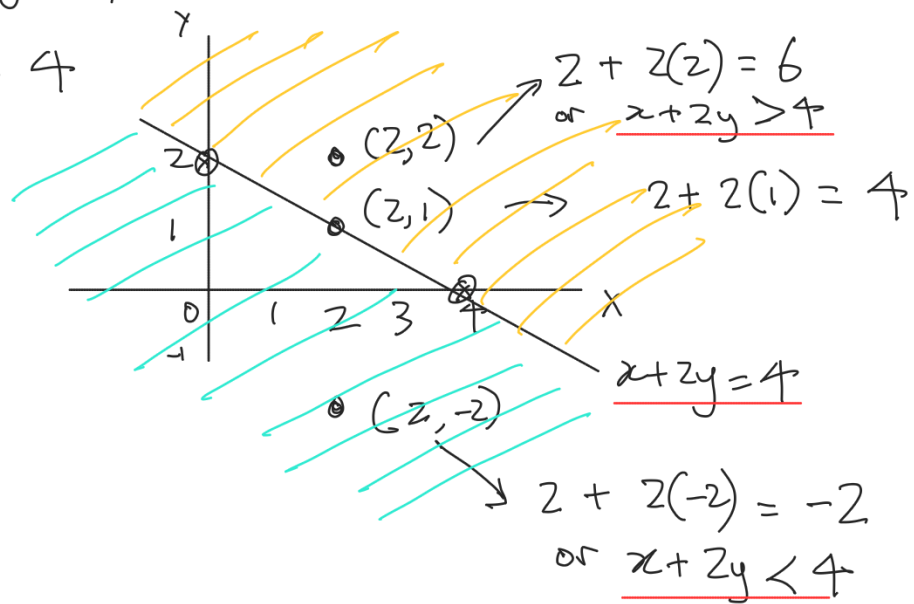


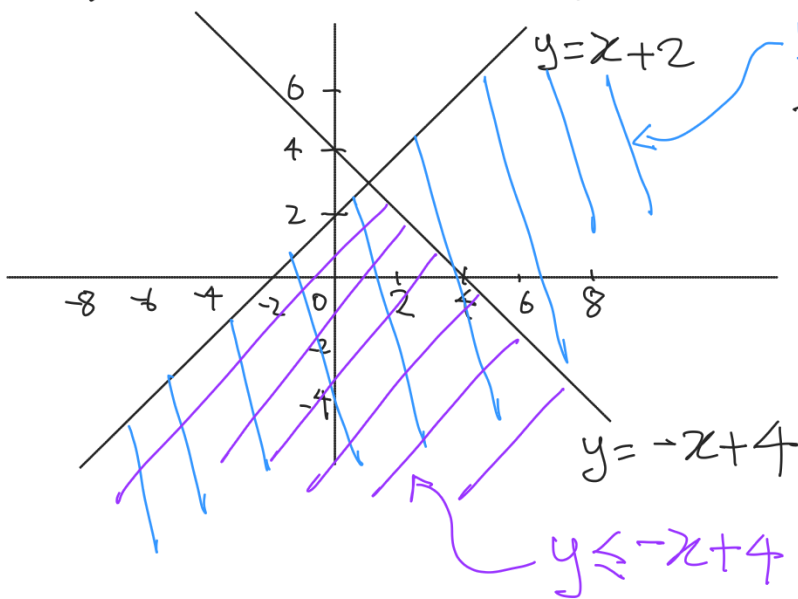
25 Linear Programming

Linear Inequality with 2 unknowns

e.g. $x + 2y = 4$



System of Linear Inequalities with 2 unknowns



The double shaded region is

$$\begin{cases} y \leq x + 2 \\ y \leq -x + 4 \end{cases}$$

Satisfy both conditions

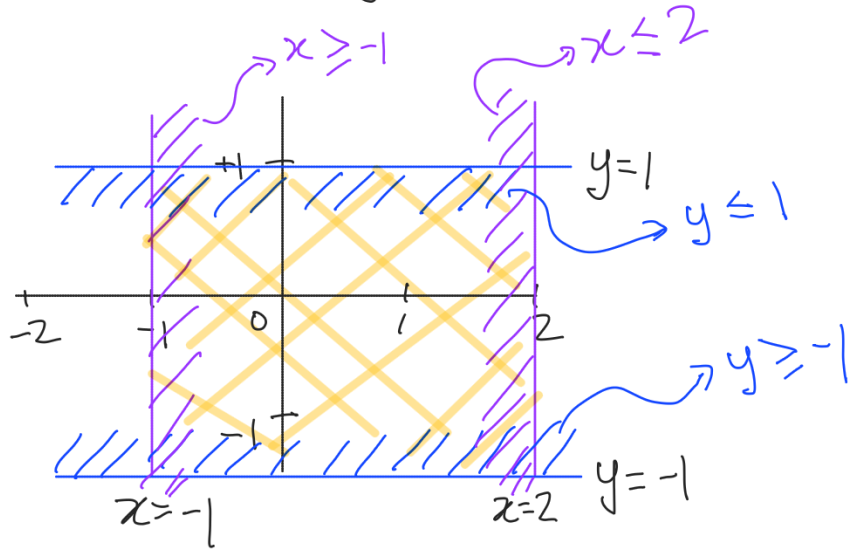
Linear Programming

e.g. constraints: $-1 \leq x \leq 2$
 $-1 \leq y \leq 1$ } 4 lines

Let us plot the graph:

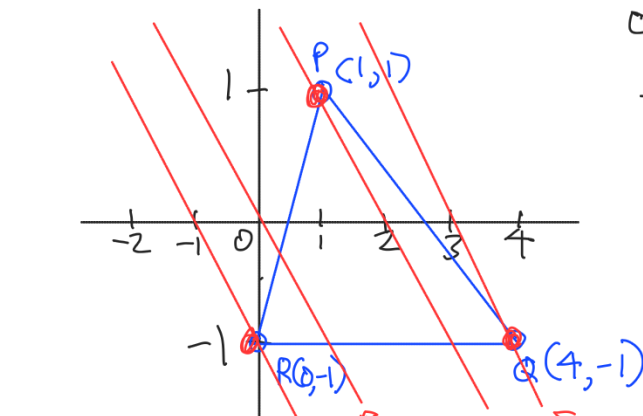


↑
satisfy
all 4
constraints



Finding the optimal values of a linear function

1st Method: Sliding Line

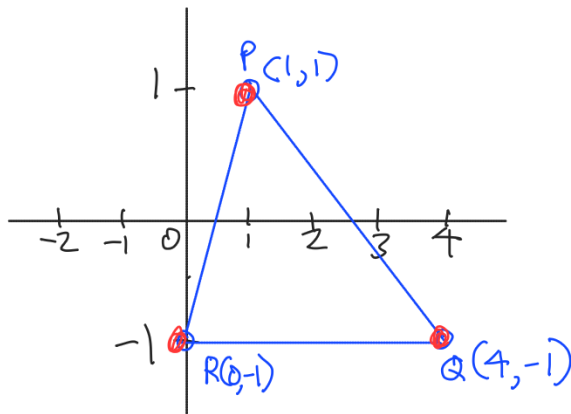


objective function: $x + y = C$
find the max and min
values of C

answer: max 3
min -1

$x + y = -1$ min value
 $x + y = 0$
 $x + y = 2$
 $x + y = 3$ max value
→ push to the right (same gradient)

2nd method: Testing vertices



$$@ P(1, 1) \Rightarrow C = 1 + 1 = 2$$

$$@ Q(4, -1) \Rightarrow C = 4 + (-1) = 3 \text{ max}$$

$$@ R(0, -1) \Rightarrow C = 0 + (-1) = -1 \text{ min}$$

Applications of Linear Programming

Steps

- 1: Identify x and y
- 2: Set up inequality equations
- 3: Plot graph and shade feasible solution area
- 4: Write down the objective function C
- 5: Find the optimal solution by method 1 or 2
- 6: Calculate the optimal (min/max) values

