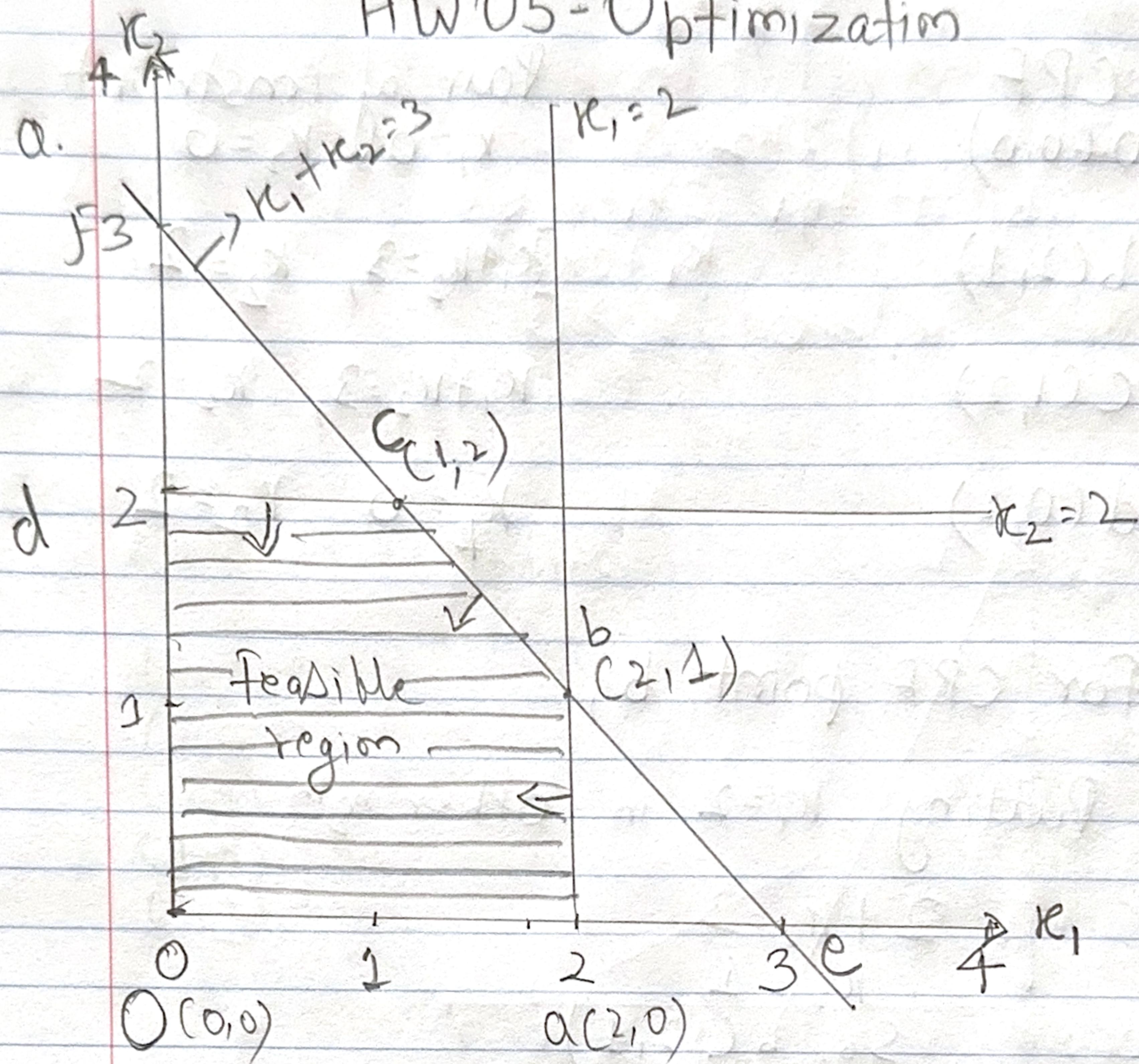


Name: Bishakha

HW05-Optimization

1 a.



$$Z = k_1 + 2k_2$$

constraints

$$k_1 \leq 2$$

$$k_2 \leq 2$$

$$k_1 + k_2 \leq 3$$

$$\text{and, } k_1 \geq 0, k_2 \geq 0$$

Putting, $k_1, k_2 = 0$ in $k_1 + k_2 = 3$, we get

point $c(3,0)$, $F(0,3)$

b. CPF
 $O(0,0)$

Pair of constraint
 $\kappa_1 = 0, \kappa_2 = 0$

$b(2,1)$

$$\kappa_1 + \kappa_2 = 3, \kappa_2 = 2$$

$c(1,2)$

$$\kappa_1 + \kappa_2 = 3, \kappa_2 = 2$$

$d(0,2)$

$$\kappa_1 = 0, \kappa_2 = 2$$

C. For CPF point b,

Putting $\kappa_1 = 2$ in other eqn

$$2 + \kappa_2 = 3$$

$$\kappa_2 = 1$$

So, $b(2,1)$

For CPF point c,

Putting $\kappa_2 = 2$ in other eqn

$$\kappa_1 + 2 = 3$$

$$\kappa_1 = 1$$

So, $c(1,2)$

for CPF point a,

$$\kappa_1 = 2, \kappa_2 = 0$$

So, $a'(2,0)$

for CPF point d

$$\kappa_2 = 2, \kappa_1 = 0, d(0,2)$$

d. CPF point

a(0,0)
b(2,0)
c(2,1)
d(1,2)
e(0,2)

Adjacency list

(0,2) (2,0)
(0,0) (2,1)
(2,0) (1,2)
(2,1) (0,2)
(0,0) (1,2)

e. Adjacent CPF pairs

(0,0) (2,0)
(2,0) (2,1)
(2,1) (1,2)
(1,2) (0,2)
(0,2) (0,0)

Shared edges

$$k_2 = 0$$

$$k_1 = 2$$

$$k_1 + k_2 = 3$$

$$k_2 = 2$$

$$k_1 = 0$$

f. $Z = 3k_1 + k_2$

su

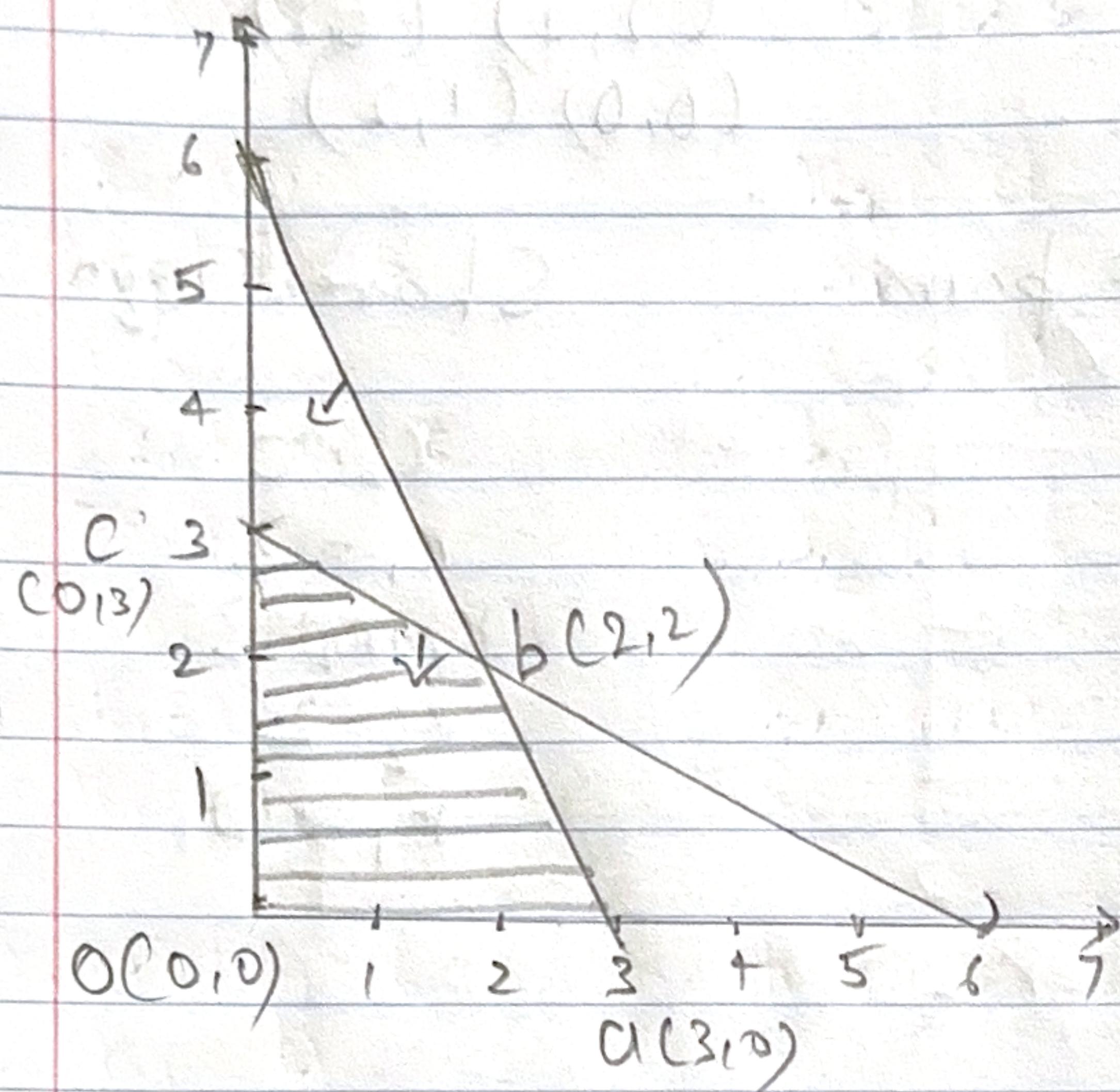
2. Problem S.1-1

a) $Z = 3x_1 + 2x_2$

Subject to: $2x_1 + x_2 \leq 6$

$x_1 + 2x_2 \leq 6$

And, $x_1 \geq 0, x_2 \geq 0$



Set of x_2^n	Corner point	CPF / CPI
$x_1=0, x_2=0$	$(0,0)$	CPF

$2x_1 + x_2 \leq 6, x_1=0$	$(0,6)$	CPI
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$x_2=0, 2x_1+x_2 \leq 6$	$(3,0)$	CPF
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$x_1=0, x_1+2x_2=6$	$(0,3)$	CPI
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$x_2=0, x_1+2x_2=6$	$(6,0)$	CPF
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$x_1+2x_2=6, 2x_1+x_2=6$	$(2,2)$	CPF
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C

Constraint in augmented form

$$2K_1 + K_2 + S_1 = 6$$

$$K_1 + 2K_2 + S_2 = 6$$

and

$$K_j \geq 0 \text{ for } j=1, 2$$

$$S_i \geq 0 \text{ for } i=1, 2$$

CPF Solution

$$(0, 0)$$

$$(3, 0)$$

$$(2, 2)$$

$$(0, 3)$$

$$(0, 6)$$

$$(6, 0)$$

defining e_2^h

$$K_1 = 0, K_2 = 0$$

$$K_2 = 0, 2K_1 + K_2 = 6$$

$$K_1 + 2K_2 = 6, 2K_1 + K_2 = 6$$

$$K_1 = 0, K_1 + 2K_2 = 6$$

$$2K_1 + K_2 = 6, K_1 = 0$$

$$K_2 = 0, K_1 + 2K_2 = 6$$

BF Solution

$$0, 0, 6, 6$$

$$3, 0, 0, 3$$

$$2, 2, 0, 0$$

$$0, 3, 3, 0$$

$$0, 6, 0 - 6$$

$$6, 0, -6, 0$$

d. defining e_2^h

Indicating Variable

$$K_1 \geq 0$$

$$K_1$$

$$K_2 \geq 0$$

$$K_2$$

$$2K_1 + K_2 \leq 6$$

$$S_1$$

$$K_1 + 2K_2 \leq 6$$

$$S_2$$

Set of eqⁿ

Indicating variables

Set of eqⁿ after deleting indicating variables

①

$$K_1 = 0$$

$$K_2 = 0$$

$$K_1$$

$$K_2$$

$$S_1 = 6$$

$$S_2 = 6$$

②

$$K_2 = 0$$

$$2K_1 + K_2 = 6$$

$$K_2$$

$$S_1$$

$$2K_1 = 6$$

$$K_1 + S_2 = 6$$

③

$$K_1 + 2K_2 = 6$$

$$2K_1 + K_2 = 6$$

$$S_1$$

$$S_2$$

$$K_1 + 2K_2 = 6$$

$$2K_1 + K_2 = 6$$

④

$$K_1 = 0$$

$$K_1 + 2K_2 = 6$$

$$K_1$$

$$S_2$$

$$K_2 + S_1 = 6$$

$$2K_2 = 6$$

⑤

$$2K_1 + K_2 = 6$$

$$K_1 = 0$$

$$K_1$$

$$S_1$$

$$K_2 = 6$$

$$2K_2 + S_2 = 6$$

⑥

$$K_2 = 0, 1$$

$$K_1 + 2K_2 = 6$$

$$K_2$$

$$S_2$$

$$2K_1 + S_1 = 6$$

$$K_1 = 6$$

Solving each set of eqⁿ to get BF soln:-

① $K_1 = 0, K_2 = 0, S_1 = 6, S_2 = 6$

②

$$2K_1 = 6$$

$$K_1 = 3$$

$$K_1 + S_2 = 6, S_2 = 6 - 3 = 3$$

$$K_1 = 3, K_2 = 0, S_1 = 0, S_2 = 3$$

③ $k_1 + 2k_2 = 6$
 $2k_1 + k_2 = 6$
 $k_1 = 2, k_2 = 2, S_1 = 0, S_2 = 0$

④ $k_2 + S_1 = 6$
 $2k_2 = 6$
 $k_2 = 3$
 $S_1 = 6 - 3$
 $= 3$
 $k_1 = 0, k_2 = 3, S_1 = 3, S_2 = 0$

⑤ $k_2 = 6$
 $2k_2 + S_2 = 6$
 $12 + S_2 = 6$
 $S_2 = -6$
 $k_1 = 0, k_2 = 6, S_1 = 0, S_2 = -6$

⑥ $k_1 = 6$
 $2k_1 + S_1 = 6$
 $12 + S_1 = 6$
 $S_1 = -6$
 $k_1 = 6, k_2 = 0, S_1 = -6, S_2 = 0$

Comparison:-

corner point	Basic F (part C)	Part d
(0,0)	0,0,6,6	0,0,6,6
(3,0)	3,0,0,3	3,0,0,3
(2,2)	2,2,0,0	2,2,0,0
(0,3)	0,3,3,0	0,3,3,0
(0,6)	0,6,0,-6	0,6,0,-6
(6,0)	6,0,-6,0	6,0,-6,0

e. CPF sequence path :-

$$(0,0) \rightarrow (3,0) \rightarrow (2,2)$$

$$\text{Step 1: } (0,0) \rightarrow (3,0)$$

- Deleted defining eqn: $k_1 = 0$
- Added defining eqn: $2k_1 + k_2 = 6$
- Deleted indicating variable: k_1
- Added indicating variable: s_1

Step 2:-

2. $(3,0) \rightarrow (2,2)$

- Deleted defining eqn: $K_2=0$
- Added defining eqn: $K_1+2K_2=6$
- Deleted indicating variable: K_2
- Added indicating variable: S_2

At $(2,2)$, $Z=10$, optimal answer.