1 (a) set x\_2 x\_4 x\_5 all to 0, then just solve the two equalities to get

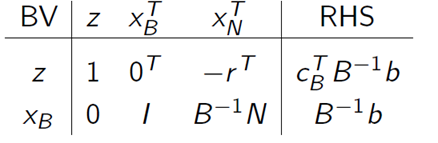
-230; x\_1 = 30, x\_3 = 70.

(b) z = gives same result (NB assumed x\_N = 0 so don’t need to consider the second part)

\Pi = ( -9 -7 )T

(c) r = ( 18 9 7 )T >= 0 so it’s optimal

(d)



|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | X\_1 | X\_3 | X\_2 | X\_4 | X\_5 |  |
| Z |  |  | -18 | -9 | -7 | -230 |
| X\_1 | 1 |  | 4 | 1 | 1 | 30 |
| X\_3 |  | 1 | 8 | 3 | 2 | 70 |

2(a) <OUT OF SYLLABUS>

(b) TODO

3(a) let s\_i be startup cost for product i; r\_i be rev per unit

Max sum r\_i x\_i – s\_i d\_i over all i; (d\_i is whether x\_i >= 0, i.e. whether product i is invested in)

x\_i <= M (k\_i) and d\_i = k\_i for all i, k\_i and d\_i in {0, 1}, M is large int, can choose 10000.

sum of all x\_i <= 10000

all x\_i >= 0

(b)

Now we know d\_i = 1 if project i taken. So simply

s\_2 = 20000 + 20000 (1-d\_1)

(c) Similarly

r\_4 = 80 + 20(1-d\_3)

(d)

d\_3 + d\_4 = 1

4 (a)

Consider the binary variable XY, , X = 1 if invest in new production facilities, Y = 1 if decide to improve product design

The payoff in the matrix is P = profit(A) – profit(B)

Example for A : 01; B : 00, P = 75 \* 3 - 100 - 25\*3 = 50

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | 00 | 01 | 10 | 11 |
| 00 | 0 | -50 | -25 | -100 |
| 01 | 50 | 0 | -50 | -125 |
| 10 | 25 | 50 | 0 | -25 |
| 11 | 100 | 125 | 25 | 0 |

(b)

-no dominated rows/cols

-no, show table with alpha and beta

-yes

-refer to notes