MATLAB Computations

```
>> A = [3 2 1 4 1 0; 4 3 3 3 0 -1; 1 1 1 1 0 0]
```

$$A = \begin{matrix} 3 & 2 & 1 & 4 & 1 & 0 \\ 4 & 3 & 3 & 3 & 0 & -1 \\ 1 & 1 & 1 & 1 & 0 & 0 \end{matrix}$$

```
>> B = A(:,[1 2 6])
```

$$B = \begin{matrix} 3 & 2 & 0 \\ 4 & 3 & -1 \\ 1 & 1 & 0 \end{matrix}$$

```
>> N = A(:,[3 4 5])
```

$$N = \begin{matrix} 1 & 4 & 1 \\ 3 & 3 & 0 \\ 1 & 1 & 0 \end{matrix}$$

```
>> b = [7 8 3]'
```

$$b = \begin{matrix} 7 \\ 8 \\ 3 \end{matrix}$$

```
>> Binv = inv(B)

            1      0     -2
Binv =     -1      0      3
            1     -1      1

>> Binv*b

        1
ans =   2
        2

>> -Binv*N

          1     -2     -1
ans  =   -2      1      1
          1     -2     -1
```

Recall: $x_B = B^{-1}b - B^{-1}N\,x_N$

```
>> c = [28 30 20 25 0 0]

c =    28     30     20     25     0     0

>> cB = c([1 2 6])

cB =   28     30      0

>> cN = c([3 4 5])

cN =   20     25      0

>> rc = cN - cB*Binv*N

rc =   -12     -1      2
```

These are the reduced costs of the nonbasic variables x_3, x_4, x_5.

The current basis $\{1, 2, 6\}$ is not optimal.

Try the basis defined by columns/variables $\{3, 5, 6\}$:

```
>> B = A(:,[3 5 6])

       1      1      0
B =    3      0     -1
       1      0      0

>> N = A(:,[1 2 4])

       3      2      4
N =    4      3      3
       1      1      1

>> Binv = inv(B)

          0      0      1
Binv =    1      0     -1
          0     -1      3

>> Binv*b

         3
ans =    4
         1
```

```
>> -Binv*N

         -1     -1     -1
ans =    -2     -1     -3
          1      0      0

>> cB = c([3 5 6])

cB =   20      0      0

>> cN = c([1 2 4])

cN =   28     30     25

>> rc = cN - cB*Binv*N

rc =      8     10      5

>> z = cB*Binv*b

z = 60
```

Since all reduced costs are nonnegative, the basis $\{3, 5, 6\}$ is optimal.

Let's look at the direction defined by increasing the nonbasic variable x_4.

```
      3      2      1      4      1      0

A =   4      3      3      3      0     -1

      1      1      1      1      0      0


c = 28     30     20     25      0      0


>> d = [-2 1 0 1 0 -2]'


     -2

      1

d =   0

      1

      0

     -2


        0

A*d =   0

        0


c*d = -1
```

In general we have $A\mathbf{d} = 0$ and $\mathbf{c}^{\mathrm{T}}\mathbf{d} < 0$.