Dual Simplex Method

→ Special type of simplex.

→ Optimality is Maintained in all the iteration

for Min $C_j - Z_j \geq 0$ is optimal.

If we get negative value Dual Simplex is not applicable.

Initially the Solution may not be feasable

For Min $Sol^n \geq 0$ (Non-negative)

it can be infeasable initially.

If the problem is feasable in an iteration. then the procedure will be stopped. because Soution is feasable & optimal.

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$$\text{Min } z = x_1 + 2x_2 + 3x_3$$

$$2x_1 - x_2 + x_3 \geq 4$$

$$x_1 + x_2 + 2x_3 \leq 8$$

$$x_2 - x_3 \geq 2$$

$$x_1, x_2, \text{and } x_3 \geq 0$$

Convert $\geq$ to $\leq$

For Minimization only '$\le$' type is required

$$\Rightarrow -2x_1 + x_2 - x_3 \le -4$$
$$x_1 + x_2 + 2x_3 \le 8$$
$$-x_2 + x_3 \le -2$$

$$\Rightarrow -2x_1 + x_2 - x_3 + S_1 = -4$$
$$x_1 + x_2 + 2x_3 + S_2 = 8$$
$$-x_2 + x_3 + S_3 = -2$$

$$z = x_1 + 2x_2 + 3x_3 + 0S_1 + 0S_2 + 0S_3$$

C_{B_i}	C_j / B.V	1 x_1	2 x_2	3 x_3	0 S_1	0 S_2	0 S_3	Solution
0	S_1	-2	1	-1	1	0	0	-4
0	S_2	1	1	2	0	1	0	8
0	S_3	0	-1	1	0	0	1	-2
	z_j	0	0	0	0	0	0	
	$C_j - z_j$	1	2	3	0	0	0	

We need to See if the problem is feasable or not. We will find smallest value from Solⁿ

Determination of Entering Variable

	1	2	3	0	0	0	
	x_1	x_2	x_3	S_1	S_2	S_3	
$-(C_j - Z_j)$	-1	-2	-3	0	0	0	
S_1 (Ignore +ve & 0 value of S_1)	-2	1	-1	1	0	0	
Ratio	$1/2$	—	3	—	—	—	
z_j							
$C_j - Z_j$							

Find the smallest value

C_{B_i}	C_j	1	2	3	0	0	0	Solution
	B.V	x_1	x_2	x_3	S_1	S_2	S_3	
1	x_1	1	$-1/2$	$1/2$	$-1/2$	0	0	-2
0	S_2	0	$3/2$					
0	S_3							
	z_j	1	$-1/2$	$1/2$	$-1/2$	0	0	
	$C_j - Z_j$	0	$5/2$	$5/2$	$1/2$	0	0	

S_2 Row = Old Value − (Key Column * New Row)

$\Rightarrow 1 - (1 * 1)$

$\Rightarrow 1 - (1 * -1/2) = 3/2$

$S_2 = 0 \quad 3/2 \quad 3/2 \quad 1/2 \quad 1 \quad 0$

$S_3 = 0 \quad -1 \quad 1 \quad 0 \quad 0 \quad 1$

After finding $c_j - z_j$ check optimality