Simplex Special Cases

- Unbounded:
  - When all $\theta_i < 0$

Maximize			2	3	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
1	3	x_2	1	1	-1	0	3	-
2	0	x_4	3	0	-2	1	10	-
		z_j	3	3	-3	0	9	
		$C_j - z_j$	-1	0	3	0		

Simplex Special Cases

- Infeasible:
  - When final solution has **artificial variable**.

Maximize			4	3	0	0	0	-M		
i	c_B	x_B	x_1	x_2	x_3	x_4	x_5	x_6	b_i	θ_i
1	3	x_2	0	1	$\frac{2}{3}$	$-\frac{1}{3}$	0	0	1	
2	4	x_1	1	0	$\frac{1}{3}$	$\frac{1}{3}$	0	0	2	
3	-M	x_6	0	0	$-\frac{1}{3}$	$-\frac{1}{3}$	-1	1	2	
		z_j	4	3	$\frac{10+M}{3}$	$\frac{1+M}{3}$	+M	-M	11-2M	
		$C_j - z_j$	0	0	$\frac{-10-M}{3}$	$\frac{-1-M}{3}$	-M	0		

Simplex Special Cases

- Alternate Optimal:
  - When non-basic variable has $c_j - z_j = 0$

Maximize			3	2	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
1	2	x_2	0	1	$\frac{5}{11}$	$-\frac{3}{11}$	$\frac{30}{11}$	-
2	3	x_1	1	0	$-\frac{3}{22}$	$\frac{2}{11}$	$\frac{24}{11}$	12
		z_j	3	2	$\frac{1}{2}$	0	12	
		$C_j - z_j$	0	0	$-\frac{1}{2}$	0		

Simplex Special Cases

- Alternate Optimal:

Maximize			3	2	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
1	2	x_2	$\frac{3}{2}$	1	$\frac{1}{4}$	0	6	
2	0	x_4	$\frac{11}{2}$	0	$-\frac{3}{4}$	1	12	
		z_j	3	2	$\frac{1}{2}$	0	12	
		$C_j - z_j$	0	0	$-\frac{1}{2}$	0		

Midterm

- Complete the missing table of each of the following tables (all the problems are maximization problems)
  1-

Maximize			3	2	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
1	0	x_3		2.2		-0.6	6	
2	3	x_1		0.3		0.1	3	
		z_j						
		$c_j - z_j$						

Midterm

- Complete the missing table of each of the following tables (all the problems are maximization problems)

1-

Maximize			3	2	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
1	0	x_3	0	2.2	1	-0.6	6	
2	3	x_1	1	0.3	0	0.1	3	
		z_j						
		$c_j - z_j$						

Midterm

Maximize			3	2	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
1	0	x_3	0	2.2	1	-0.6	6	$\frac{30}{11}$
2	3	x_1	1	0.3	0	0.1	3	10
		z_j	3	0.9	0	0.3	9	
		$C_j - z_j$	0	1.1	0	-0.3		

Midterm

Maximize			3	2	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
1	0	x_3	0	2.2	1	-0.6	6	$\frac{30}{11}$
2	3	x_1	1	0.3	0	0.1	3	10
		z_j	3	0.9	0	0.3	9	
		$c_j - z_j$	0	1.1	0	-0.3		

Out
(Pivot Column)

In
(Pivot Column)

Midterm

Maximize			3	2	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
1	2	x_2	0	1	$\frac{5}{11}$	$-\frac{3}{11}$	$\frac{30}{11}$	-
2	3	x_1	1	0	$-\frac{3}{22}$	$\frac{2}{11}$	$\frac{24}{11}$	12
		z_j	3	2	$\frac{1}{2}$	0	12	
		$C_j - z_j$	0	0	$-\frac{1}{2}$	0		

X2 = 30/11, x1 = 24/11

Midterm

2-

Maximize			3	2	-M	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	x_5	b_i	θ_i
1	3	x_1		1	1	-1		3	
2	0	x_5		-3	-1	1		1	
		z_j							
		$c_j - z_j$							

Midterm

Maximize			3	2	-M	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	x_5	b_i	θ_i
1	3	x_1	1	1	1	-1	0	3	-
2	0	x_5	0	-3	-1	1	1	1	1
		z_j	3	3	3	-3	0	9	
		$c_j - z_j$	0	-1	-M - 3	3	0		

Midterm

Maximize			3	2	-M	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	x_5	b_i	θ_i
1	3	x_1	1	1	1	-1	0	3	-
2	0	x_5	0	-3	-1	1	1	1	1
		z_j	3	3	3	-3	0	9	
		$C_j - z_j$	0	-1	-M - 3	3	0		

Out
(Pivot
Column)

In
(Pivot Column)

Midterm

Maximize			3	2	-M	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	x_5	b_i	θ_i
1	3	x_1	1	-2	0	0	1	4	-
2	0	x_4	0	-3	-1	1	1	1	-
		z_j	3	-6	0	0	3	12	
		$c_j - z_j$	0	8	-M	0	-3		

Midterm

Maximize			3	2	-M	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	x_5	b_i	θ_i
1	3	x_1	1	-2	0	0	1	4	-
2	0	x_4	0	-3	-1	1	1	1	-
		z_j	3	-6	0	0	3	12	
		$c_j - z_j$	0	8	-M	0	-3		

In
(Pivot Column)

Unbounded

Midterm

Destinations / Sources	1	2	3	4	5	Supplies
A	5	7	10	13	15	500
B	8	6	9	12	13	1000
C	10	7	8	9	11	1000
Demands	300	300	1000	500	400	

Midterm

Destinations / Sources	1	2	3	4	5	Supplies
A	5	7	10	13	15	~~500~~ 200
	300	200	0	0	0	
B	8	6	9	12	13	~~1000~~ 900
	0	200	900	0	0	
C	10	7	8	9	11	~~1000~~ 900
	0	0	100	500	400	
Demands	~~300~~ 0	~~300~~ 100	~~1000~~ 100	500	400	
		0	0			

Simplex Special Cases

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  - When all $\theta_i < 0$

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i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
1	3	x_2	1	1	-1	0	3	-
2	0	x_4	3	0	-2	1	10	-
		z_j	3	3	-3	0	9	
		$C_j - z_j$	-1	0	3	0		

Simplex Special Cases

- Infeasible:
  - When final solution has **artificial variable**.

Maximize			4	3	0	0	0	-M		
i	c_B	x_B	x_1	x_2	x_3	x_4	x_5	x_6	b_i	θ_i
1	3	x_2	0	1	$\frac{2}{3}$	$-\frac{1}{3}$	0	0	1	
2	4	x_1	1	0	$\frac{1}{3}$	$\frac{1}{3}$	0	0	2	
3	-M	x_6	0	0	$-\frac{1}{3}$	$-\frac{1}{3}$	-1	1	2	
		z_j	4	3	$\frac{10+M}{3}$	$\frac{1+M}{3}$	+M	-M	11-2M	
		$C_j - z_j$	0	0	$\frac{-10-M}{3}$	$\frac{-1-M}{3}$	-M	0		

Simplex Special Cases

- Alternate Optimal:
  - When non-basic variable has $c_j - z_j = 0$

Maximize			3	2	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
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2	3	x_1	1	0	$-\frac{3}{22}$	$\frac{2}{11}$	$\frac{24}{11}$	12
		z_j	3	2	$\frac{1}{2}$	0	12	
		$C_j - z_j$	0	0	$-\frac{1}{2}$	0		

Simplex Special Cases

- Alternate Optimal:

Maximize			3	2	0	0		
i	c_B	x_B	x_1	x_2	x_3	x_4	b_i	θ_i
1	2	x_2	$\frac{3}{2}$	1	$\frac{1}{4}$	0	6	
2	0	x_4	$\frac{11}{2}$	0	$-\frac{3}{4}$	1	12	
		z_j	3	2	$\frac{1}{2}$	0	12	
		$C_j - z_j$	0	0	$-\frac{1}{2}$	0		