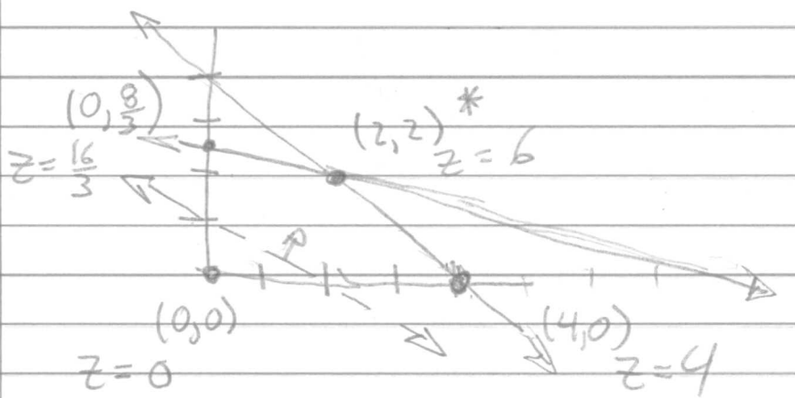
ETM 645 - HW#2

Scott Schultz

4.1-5

Max $Z = x_1 + 2x_2$



$x_1 + 3x_2 = 8$

$x_1 + x_2 = 4$ $\quad x_1 = 4 - x_2$

$4 - x_2 + 3x_2 = 8$

$x_2 = 2$, $x_1 = 2$

c) $(0,0) \rightarrow (4,0) \rightarrow (2,2)$

OR

$(0,0) \rightarrow (0, 8/3) \rightarrow (2,2)$

ETM 645 - HW#2

Scott Schultz

4.4-2

		1	2	0	0	
C_B	X_B	X_1	X_2	X_3	X_4	RHS
0	X_3	1	3	1	0	8
0	X_4	1	1	0	1	4
	C_j	1	2	0	0	$Z=0$

X_2 - enters

X_3 - leaves $\quad X_3\ 8/3,\ X_4\ 4$

		~~1~~	2	0	0	
C_B		~~X_1~~	~~X_2~~	X_3	X_4	RHS
2	X_2	1/3	1	1/3	0	8/3
0	X_4	2/3	0	-1/3	1	4/3
	C_j	1/3	0	-2/3	0	$Z=16/3$

X_1 - enters

X_4 - leaves $\quad X_2\ \frac{8}{3}\div\frac{1}{3}=8,\ X_4\ \frac{4}{3}\div\frac{2}{3}=2$

		1	2	0	0	
		X_1	X_2	X_3	X_4	RHS
2	X_2	0	1	1/2	-1/2	2
1	X_1	1	0	-1/2	3/2	2
	C_j	0	0	-1/2	-1/2	$Z=6$

ETM 645 - HW#2

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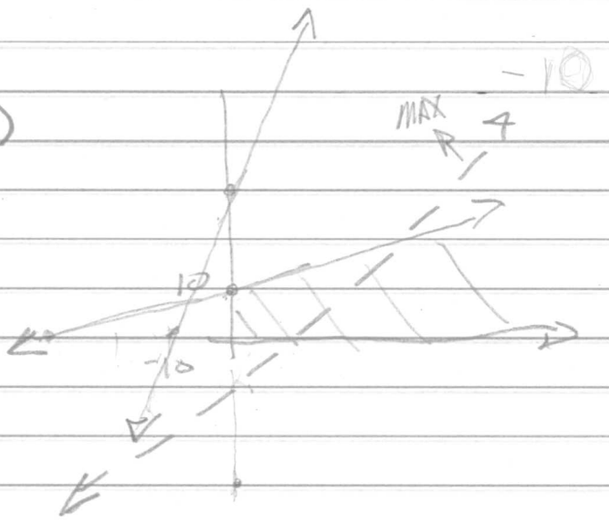
4.5-2 a)



b) YES, OPTIMAL AT (0,10) $Z = 10$

c) IF $\overset{MAX}{Z} = X_1 - X_2$

THEN OBJECT ISOBARS MOVE IN OPOSITE DIRECTION, WITH $Z = \infty$

d) NO, GOOD SOLUTIONS EXIST. A REALISTIC CONSTRAINT MAY HAVE BEEN OVERLOOKED.

e)

ETM 645 - HW#2

Scott Schultz

e)

		1	-1	0	0	
		x_1	x_2	x_3	x_4	RHS
0	x_3	-1	3	1	0	30
0	x_4	-3	1	0	1	30
		1	-1	0	0	$z=0$

x_1 - enters

WHAT LEAVES? $x_3 - \frac{30}{-1}$

$x_3 - -\frac{30}{3}$

BOTH RATIOS ARE NEGATIVE $\therefore$ UNBOUNDED

ETM645 - HW#2

Scott Schultz

4.6-1 b) Max $Z = 2X_1 + 3X_2 + 0X_3 - MX_4$

c) S.T. $X_1 + 2X_2 + X_3 = 4$

$X_1 + X_2 + X_4 = 3$

$X_1, X_2 \geq 0$

		2	3	0	-M	
		X_1	X_2	X_3	X_4	RHS
0	X_3	1	2	1	0	4
-M	X_4	1	1	0	1	3
	$\bar{C}_j$	2+M	3+M	0	0	$Z = -3M$

X_2 - enters

X_3 - leaves

		2	3	0	-M	
		X_1	X_2	X_3	X_4	RHS
3	X_2	1/2	1	1/2	0	2
-M	X_4	1/2	0	-1/2	1	1
	$\bar{C}_j$	1/2+M/2	0	-3/2-M/2	0	$Z = 6 - M$

X_1 - enters

X_4 - leaves

		2	3	0	-M	
		X_1	X_2	X_3	X_4	RHS
3	X_2	0	1	1	-1	1
2	X_1	1	0	-1	2	2
	$\bar{C}_j$	0	0	-1	-M-1	$Z = 7$ *

ETM 645 - HW#2

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4.6-3

a) (-) MAX $Z = -2X_1 - 3X_2 - X_3 - MX_6 - MX_7$

s.t. $X_1 + 4X_2 + 2X_3 - X_4 + X_6 = 8$

$3X_1 + 2X_2 - X_5 + X_7 = 6$

$X_i \geq 0 \quad \forall i = 1 \ldots 7$

b)

		-2	-3	-1	0	0	-M	-M	
C_B	X_B	X_1	X_2	X_3	X_4	X_5	X_6	X_7	
-M	X_6	1	4	2	-1	0	1	0	8
-M	X_7	3	2	0	0	-1	0	1	6
		-2+4M	-3+6M	-1+2M	-M	-M	0	0	-14M

X_2 - enters $\quad X_7$ 6/2

X_6 - leaves $\quad X_6$ 8/4

		-2	-3	-1	0	0	-M	-M	
		X_1	X_2	X_3	X_4	X_5	X_6	X_7	RHS
-3	X_2	1/4	1	1/2	-1/4	0	1/4	0	2
-M	X_7	2 1/2	0	-1	1/2	-1	-1/2	1	2
	$\bar{C}_j$	2 1/2 M	0	-M	M/2	-M	-3/2 M	0	Z = -6-2M

X_1 - enters

X_7 - leaves

2 - 1/4 (4/5)

- 1/4 (2/5)

1/4 - 1/4 (-1/5)

0 - 1/4 (-2/5)

-1/4 - 1/4 (1/5)

1/2 - 1/4 (-3/5)

OR1 - 1/4 NR2

		-2	-3	-1	0	0	-M	-M	
C_B	X_B	X_1	X_2	X_3	X_4	X_5	X_6	X_7	RHS
-3	X_2	0	1	3/5	-3/10	1/10	3/10	-1/10	9/5
-2	X_1	1	0	-2/5	1/5	-2/5	-1/5	2/5	4/5
	$\bar{C}_j$	0	0	-1/5	-1/5	-1/2	-M	-M	Z = -35/5 = -7

OR Z = 7 FOR ORIGINAL