29. First we need to put the problem in standard form. We will introduce slack variables into constraints 1 and 2 and because constraint 3 is a strict equality we will introduce an artificial variable a_3.

$$\max\ 120x_1 + 80x_2 + 14x_3 + 0s_1 + 0s_2 - Ma_3$$
$$\text{s.t. } 4x_1 + 8x_2 + x_3 + 1s_1 = 200$$
$$2x_2 + x_3 + s_2 = 300$$
$$32x_1 + 4x_2 + 2x_3 + a_3 = 400$$
$$x_1, x_2, x_3, s_1, s_2, a_3 \geq 0$$

in Tableau form we get:

		x_1	x_2	x_3	s_1	s_2	a_3	
		120	80	14	0	0	-M	
s_1	0	4	8	1	1	0	0	200
s_2	0	0	2	1	0	1	0	300
a_3	-M	32	4	2	0	0	1	400
		-32M	-4M	-2M	0	0	-M	-400M
$c_j - z_j$		(120+32M)	(80+4M)	(14+2M)	0	0	0	

The initial basic solution is (0,0,0,200, 300, 400) which gives the o.f. = -400M

After inspecting the Tableau we see that we want to pivot in row 3, column 1. After pivoting we get the following Tableau (we bring x_1 into the basis and remove a_3 so we will eliminate the a_3 column from the Tableau):

		x_1	x_2	x_3	s_1	s_2	
		120	80	14	0	0	
s_1	0	0	$\frac{15}{2}$	$\frac{3}{4}$	1	0	150
s_2	0	0	2	1	0	1	300
x_1	120	1	$\frac{1}{8}$	$\frac{1}{16}$	0	0	$\frac{25}{2}$
		120	15	7.5	0	0	1500
		0	65	6.5	0	0	

This solution is (12.5, 0, 0, 150, 300) and gives us 1500

1 cont. Inspecting the Tableau we see we want to pivot in row 1 column 2, bringing x_2 into the basis and removing s_1.

		x_1	x_2	x_3	s_1	s_2	
		120	80	14	0	0	
x_2	80	0	1	$\frac{1}{10}$	$\frac{2}{15}$	0	20
s_2	0	0	0	$\frac{4}{5}$	$\frac{-4}{15}$	1	260
x_1	120	1	0	$\frac{1}{20}$	$\frac{-1}{60}$	0	10
		120	80	14	8.67	0	2800
$c_j - z_j$		0	0	0	-8.67	0	

This solution is (10, 20, 0, 0, 260)

This is an optimal solution which gives us $120(10) + 20(80) = 2800$

When we look at the $c_j - z_j$ row we see there is a zero in the x_3 column, which is a non basic variable. This means we will have alternate optimal solutions. Pivoting in row 1 column 3 (bringing x_3 into the basis, removing x_2) we get the alternate optimal solution:

		x_1	x_2	x_3	s_1	s_2	
		120	80	14	0	0	
x_3	14	0	10	1	$\frac{4}{3}$	0	200
s_2	0	0	-8	0	$-\frac{4}{3}$	1	100
x_1	120	1	$-\frac{1}{2}$	0	$-\frac{1}{12}$	0	0
		120	80	14	8.67	0	2800
		0	0	0	-8.67	0	

This gives a solution (0, 0, 200, 0, 100)

This gives the objective function the value: $(0)120 + 0(80) + 200(14) = 2800$ so we see it is an alternate optimal solution.