Name

SHOW AS MUCH WORK AS POSSIBLE BECAUSE YOU MAY RECEIVE PARTIAL CREDIT FOR THE WORK YOU DO IF YOUR ANSWER IS INCORRECT.

1. Formulate the following problem as a <u>standard minimum problem</u> using the given definitions of y_1 and y_2: (DO NOT SOLVE THE PROBLEM)

A pasta company is expanding its linguini production facility. Two machines are available: a small-capacity machine costing \$5000 that produces 20 pounds per minute and needs 1 operator, and a large-capacity machine costing \$6000 that produces 30 pounds per minute and needs 2 operators. The company wants to hire no more than 34 additional employees yet increase production by at least 600 pounds per minute. The company needs to find out how many of each machine it should buy to expand its production at the least cost.

Let y_1 be the number of small-capacity machines and y_2 be the number of large-capacity machines.

Minimize	$C = 5000y_1 + 6000y_2$
Subject to	$\begin{cases} 20y_1 + 30y_2 \geq 600 \\ -y_1 - 2y_2 \geq -34 \\ y_1 \geq 0, y_2 \geq 0 \end{cases}$

2. For the following minimum problem, construct the dual standard maximum problem and its initial simplex tableau: (NOTE: The original minimum problem might not be in <u>standard</u> form.)

Minimize $\qquad C = 30y_1 + 40y_2 + 80y_3$

Subject to $\qquad \begin{cases} y_1 + y_2 + 2y_3 \geq 60 \\ 3y_1 + y_2 - y_3 \leq 60 \\ y_1 \geq 0, y_2 \geq 0, y_3 \geq 0 \end{cases}$

$3y_1 + y_2 - y_3 \leq 60 \rightarrow -3y_1 - y_2 + y_3 \geq -60$

$$\begin{pmatrix} 1 & 1 & 2 & 60 \\ -3 & -1 & 1 & -60 \\ 30 & 40 & 80 & 0 \end{pmatrix}^T = \begin{pmatrix} 1 & -3 & 30 \\ 1 & -1 & 40 \\ 2 & 1 & 80 \\ 60 & -60 & 0 \end{pmatrix}$$

Maximize	$P = 60x_1 - 60x_2$
Subject to	$\begin{cases} x_1 - 3x_2 \leq 30 \\ x_1 - x_2 \leq 40 \\ 2x_1 + x_2 \leq 80 \\ x_1 \geq 0, x_2 \geq 0 \end{cases}$

	x_1	x_2	s_1	s_2	s_3	
s_1	1	-3	1	0	0	30
s_2	1	-1	0	1	0	40
s_3	2	1	0	0	1	80
P/C	-60	60	0	0	0	0