2(4). Let $a =$ # of type A machines,
$b =$ # of type B machines,
$c =$ the total cost of the machines.
Part of setting up a problem is stating what the variables are. This is
done here but you will have to do this on an exam. Pick descriptive
names for your constraints, don't number them 1., 2., 3., ... .

Linear Programming Problem. Solution

$$a =$$

$$b =$$

$$c =$$

c should be between 100,000 and 200,000.

$$a + b + c = 140,008$$

4(4). Let $c =$ # acres of corn,
$s =$ # of acres of soybeans,
$t =$ # of acres of oats,
$p =$ the net profit.

Linear Programming Problem. Solution

Maximize $p =$

with

$$c =$$

$$s =$$

$$t =$$

$$p =$$

$p$ should be between 300 and 400.

$$c + s + t + p = 372$$
NOTE. To determine if say columns 1, 3 and 4 of a matrix $A$ are independent — check that 
$\text{rank}(A(:,[1,3,4])) = 3$.

1’(5). Suppose the constraint matrix $A$ is $\begin{bmatrix} 2 & 2 & 1 & 1 & 6 \\ 1 & 0 & 0 & 1 & 2 \\ 1 & 1 & 1 & 0 & 4 \end{bmatrix}$ and the constant vector $b$ is $[5; 0; 3]$. Written in matrix notation, we have:

$$A = \begin{bmatrix} 2 & 2 & 1 & 1 & 6 \\ 1 & 0 & 0 & 1 & 2 \\ 1 & 1 & 1 & 0 & 4 \end{bmatrix}, \quad b = \begin{bmatrix} 5 \\ 0 \\ 3 \end{bmatrix}$$

Classify the following possible solutions of $AX = b$ and $X \geq 0$. Circle the one best, most specific, answer.

**Solution** if $AX = b$,

**feasible** if $X \geq 0$,

**basic solution** = a solution whose nonzero variables have independent columns (but not necessarily identity columns) in $A$.

- $[0; 3; 0; 5; 6]$ —— none, feasible, solution, basic solution, feasible solution, basic feasible solution
- $[0; 2; 1; 0; 0]$ —— none, feasible, solution, basic solution, feasible solution, basic feasible solution
- $[-1; 2; 2; 1; 0]$ —— none, feasible, solution, basic solution, feasible solution, basic feasible solution
- $[2; 2; 3; -1; 0]$ —— none, feasible, solution, basic solution, feasible solution, basic feasible solution
- $[1; 2; 0; -1; 0]$ —— none, feasible, solution, basic solution, feasible solution, basic feasible solution