1. Solve Problems # 3.1-1, 3.1-9, 3.4-15, 4.4-10, 4.5-3, 4.5-4 from your textbook.

2. **bonus problem for extra credit:** If a basic feasible solution is degenerate, it is then theoretically possible that a sequence of degenerate basic feasible solutions will be generated that endlessly cycles without making progress. It is the purpose of this exercise to help develop a technique that can be applied to the Simplex method to avoid cycling.

   Corresponding to the linear system of equations $Ax = b$ where $A = [a_1, a_2, \cdots, a_n]$ and the $a_i$'s are columns of $A$. Define the *perturbed* system $Ax = b(\epsilon)$ where $b(\epsilon) := b + \epsilon a_1 + \epsilon^2 a_2 + \cdots + \epsilon^n a^n$. Show that if there is a basic feasible solution (possibly degenerate) to the unperturbed system, with the basis $B = [a_1, a_2, \cdots, a_m]$, then corresponding to the same basis, there is a non-degenerate basic feasible solution to the perturbed system for some range of $\epsilon > 0$. 