HOMEWORK #5

NOTE: If you have an electronic copy of the textbook, there may be some typographical errors in some of the following exercises, so PLEASE USE THE (CORRECT) PRINTED COPY.

1. Textbook: Exercise 5.1.1 on page 142. (12 points)

2. Textbook: Exercise 5.1.2 on page 142. (8 points)
   Note: For part (d) of this exercise, please use the vector x = (1/2, 1, 0, 0, 0).

3. Textbook: Exercise 5.1.3 on page 142. (2 points)

4. Textbook: Exercise 5.2.1 on page 145 (do this only by computing $\mathbf{c_N} - \mathbf{c_B}B^{-1}N$). (9 points)

5. Textbook: Exercise 5.2.3 on page 146 (do not do the proof). (3 points)

6. Textbook: Exercise 5.3.2 on page 150. (2 points)

7. Textbook: Exercise 5.3.3 on page 150. (12 points)

8. Textbook: Exercise 5.4.3 on page 157. (9 points)

9. Textbook: Exercise 5.4.5 on page 157. (5 points)

10. Textbook: Exercise 5.5.1 on page 164. (12 points)

11. Textbook: Exercise 5.6.1 on page 176. (15 points)

12. Textbook: Exercise 6.1.1 (a) on page 190. (5 points)

13. Consider the following LP:

$$\begin{array}{ll} \text{Min} & -x_1 - x_2 - x_3 \\ \text{s.t.} & x_1 + x_2 - x_3 = 3 \\ & 2x_1 + 6x_2 - x_3 = 7 \\ & x_1 \ , \ x_2 \ , x_3 \geq 0 \end{array}$$

   Suppose that the optimal solution to the phase 1 LP is $(\mathbf{x}, \mathbf{y}) = (x_1, x_2, x_3, y_1, y_2) = (11/4, 1/4, 0, 0, 0)$, with x_1 and x_2 being basic. Is the original LP feasible? If so, has phase 1 produced an initial bfs for the original LP? Why or why not? Explain. (2 points)

14. Consider the following LP:

$$\begin{array}{ll} \text{Min} & 1x_1 - 2x_2 + 3x_3 \\ \text{s.t.} & x_1 + x_2 - x_3 = 1 \\ & x_1 + 1/2x_2 - x_3 = 6 \\ & x_1 \ , \ x_2 \ , x_3 \geq 0 \end{array}$$

Suppose the optimal solution to the phase 1 LP is $(\mathbf{x}, \mathbf{y}) = (x_1, x_2, x_3, y_1, y_2) = (1, 0, 0, 0, 5)$. Is the original LP feasible? If so, has phase 1 produced an initial bfs for the original LP? Why or why not? Explain. (2 points)

15. Consider the following LP:

$$\begin{aligned} \text{Min} \quad & 3x_1 - x_2 - 2x_3 \\ \text{s.t.} \quad & x_1 - 2x_2 + 3x_3 = 1 \\ & 2x_1 - 4x_2 + 6x_3 = 2 \\ & x_1 \,, \; x_2 \,, x_3 \geq 0 \end{aligned}$$

Suppose the optimal solution to the phase 1 LP is $(\mathbf{x}, \mathbf{y}) = (x_1, x_2, x_3, y_1, y_2) = (1, 0, 0, 0, 0)$, with x_1 and y_1 being basic. Is the original LP feasible? If so, has phase 1 produced an initial bfs for the original LP? Why or why not? Explain. (2 points)