Please answer the following questions in complete sentences in submit the solution on Blackboard by the due date there.

**Problem 0: List your collaborators.**

Please identify anyone, whether or not they are in the class, with whom you discussed your homework. This problem is worth 1 point, but on a multiplicative scale.

**Problem 1**

Using the codes from class (or your own implementations in another language) illustrate the behavior of the simplex method on the LP from problem 13.9 in Nocedal and Wright:

\[
\begin{align*}
\text{minimize} & \quad -5x_1 - x_2 \\
\text{subject to} & \quad x_1 + x_2 \leq 5 \\
& \quad 2x_1 + (1/2)x_2 \leq 8 \\
& \quad x \geq 0
\end{align*}
\]

starting at \([0, 0]^T\) after converting the problem to standard form.

Use your judgement in reporting the behavior of the method.

**Problem 2**

Using the codes from class (or your own implementations in another language) illustrate the behavior of the simplex method on the LP.

\[
\begin{align*}
\text{minimize} & \quad -x_1 - 3x_2 \\
\text{subject to} & \quad -2x_1 + x_2 \leq 2 \\
& \quad -x_1 + 2x_2 \leq 7 \\
& \quad x \geq 0
\end{align*}
\]

starting at \([0, 0]^T\) after converting the problem to standard form.

Use your judgement in reporting the behavior of the method.

**Problem 3**

Using the codes from class (or your own implementations in another language) illustrate the behavior of the simplex method on the LP.

\[
\begin{align*}
\text{minimize} & \quad -3/4x_1 + 150x_2 - 1/50x_3 + 6x_4 \\
\text{subject to} & \quad 1/4x_1 - 60x_2 - 1/25x_3 + 9x_4 \leq 0 \\
& \quad 1/2x_1 - 90x_2 + 1/50x_3 + 3x_4 \leq 0 \\
& \quad x_3 \leq 1 \\
& \quad x \geq 0
\end{align*}
\]

starting at \([0, 0, 0, 0]^T\) after converting the problem to standard form.

Use your judgement in reporting the behavior of the method.
Problem 4

Show that if we have:

\[
\begin{align*}
\text{minimize} & \quad c^T x \\
\text{subject to} & \quad Ax \leq b \\
& \quad x \geq 0
\end{align*}
\]

and \( b \geq 0 \), then \( x = 0 \) is always a vertex after converting to standard form.