Homework Assignment 3

Due: Sunday, October 17, 2021 in GS.

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1. After running the dual-simplex algorithm, we get 625 as the optimal solution after 1 iteration.

   ```
   Optimal point x found. Method used:  dual-simplex algorithm
   f(x) = 625.000000, after 1 iterations
   Time : 0.028759 seconds
   ```

2. Comparing the dual-simplex and IPM, we find that although IPM had more iterations, it took less time for IPM to converge on the optimal solution.

   ```
   Optimal point x found. Method used:  dual-simplex algorithm
   f(x) = 625.000000, after 1 iterations
   Time : 0.042692 seconds

   Optimal point x found. Method used:  interior-point algorithm
   f(x) = 625.000000, after 4 iterations
   Time : 0.038451 seconds
   ```

3. To efficiently modify the program for different values of n, we must find a way to efficiently generate matrices and vectors which have the form of the Klee Minty problem.

4. The dual-simplex method required 1 iteration and took 0.042692 seconds while the IPM required 4 iterations and took 0.038451 seconds.

5.

6. The simplex method crashes after we let $n > 28$. It took 1 iteration and .198109 seconds for the dual-simplex algorithm to converge.

7. The IPM took 11 iterations and .115121 seconds to converge.

8. The optimal solution for any value of n is 5^n.

9. From the iterations above, we find that although the dual simplex method requires less iterations, the interior point method tends to the optimal solution faster. We also find that although the dual-simplex method crashes for n values greater than 28, the IPM can go up to a value of 36.