Name: _____

Date: _____

Section: _____

Collaborators: _____

(Collaborators submit their individually written assignments together)

Question:	1	2	3	4	5	6	Total
Points:	15	10	20	10	20	5	80
Score:							

Instructor/grader comments:

Complexity

1. (15 points) Find the **leading** in n term (assume $n \gg 1$) of the following sum:

$$S(n) = \sum_{i=1}^{2^n} i \log(i)$$

Show all your calculations in the space below.

2. (10 points) **Estimate** the number of floating point operations (additions, multiplications, etc.) required to evaluate the determinant of a matrix of size n using LU factorization. Keep only the leading term in n.

It takes about 10^{-2} seconds (on a slow computer) to evaluate the determinant of a random matrix of size 10^4. **Estimate** how long it takes to evaluate the determinant of a random matrix of size 10^6. Present your answer and explain your reasoning in the gitlab's README.md file.

QR factorization

3. (20 points) Find the Housholder reflector P that

$$P \begin{bmatrix} -6 \\ 2 \\ 9 \end{bmatrix} = \begin{bmatrix} 11 \\ 0 \\ 0 \end{bmatrix}.$$

Show all your calculations in the space below.

4. (10 points) Let $A = QR$ be the factorization of a squre matrix A. Show that

$$\kappa_2(A) = \kappa_2(R),$$

where $\kappa_2(V)$ is the condition number of matrix V calculated using two-norm. Show all your calculations in the space below.

Matlab

5. (a) (10 points) Write two matlab functions, `normone` and `norminf` that accept a rectangular matrix as a parameter and calculate one-norm and infinity-norm of that matrix. Place the the functions in their own files. Provide the help texts.

   (b) (10 points) Write a matlab script (call it **hw05p4.m**) that tests your functions (by **comparing** the norms with the results returned by matlab's own `norm` function) using two random matrices of size $n = 50$. Use `help norm` to find out what parameters the function `norm` is required. Include the help commands for your functions in your script. Place the commands `clear`, `format compact` at the top of your script.

Gitlab

6. (5 points) Create a gitlab project called **hw05** (name it exactly as shown). Upload **all** matlab files that are required to run your code. Share the project with the instructor and the TA and grant them **Reporter** privileges.