Math 471 - Introduction to Numerical Methods - Fall 2019

Assignment # 0.
Due: Tuesday, September 3, 2019.

Peculiar behavior:

The answers to the following problems are (or should be) obvious to you. The purpose of these problems is to see if they are as obvious to your computer as they are to you.

1. a) Compute $10^n - (10^n - 1)$ for $n = 1, 2, \cdots, 30$. What answer do you expect? What answer do you get?

   b) Compute $((1 + x) - 1) - x$ for $x = 1/4$, $x = 1/3$ and for $x = 1/10$. What answer do you expect? What answer do you get?

2. The famous Hilbert matrices are given by

$$H_{ij} = 1/(i + j - 1).$$

   The $n \times n$ Hilbert matrix H is easily produced in MATLAB using the command *hilb(n)*. Consider the linear system $Hx = b$ where x is the vector $x = [1, \ldots, 1]^T$ of length n, and set up the right hand side vector b by multiplying $b = Hx$. Now consider the linear system $Hy = b$ for the matrix H and right hand side vector b as above, and try to solve this system pretending you don't know the solution. Later in the course, we will discuss algorithms for solving linear systems. For now, the solution can be easily produced using MATLAB, by the command $y = H\backslash b$. Do the calculation for $n = 5$. What answer do you expect? What answer do you get? Repeat the calculation for $n = 10, 20$.