1. (15 points) Give the first few terms in the Taylor Series expansion of $e^x$. (Show your work for the derivation. You can check your answer on p.25 in Heath.) What are the forward and backward errors if we approximate the exponential function by using the first two terms in the series for $x = 1, 2, 3$?

2. (10 points) Consider a floating point system with base $\beta = 2$, precision $p = 8$, and exponent range: $L = -10, U = 10$.
   (a) Provide UFL and OFL (underflow and overflow limits) for this system.
   (b) List the two smallest machine numbers greater than 0.
   (c) Give an example of a calculation that will result in overflow.
   (d) Give an example of a calculation that will result in underflow.

3. (15 points) Recall that, in exact arithmetic, addition and multiplication are commutative and associative. In addition, multiplication distributes over addition. Give examples of floating point numbers $x, y,$ and $z$ for which addition is not associative. Find another example for multiplication. Does multiplication distribute over addition in floating point arithmetic? Give evidence to support your answer.

4. (10 points) Do Problem 1.11 on page 43 in Heath.

5. (10 points) For what values of $x$ is the calculation $f(x) = x^{1/3}$ most sensitive? Least sensitive? **Hint:** Examine the condition number of $f(x)$. Justify your answer.