1. Section 1.2: 4abc
   This question begins "Perform the following computations (i) exactly, ..."

2. Section 1.2: 10
   This question begins "The number e can be defined by ..."

3. Section 1.2: 12
   This question begins "Let $f(x) = \dfrac{e^x - e^{-x}}{x}$."

4. Compute $\kappa(x, f)$ (the condition number for f at x) for

   (a) $f(x) = e^x$

   (b) $f(x) = x^p \quad (p \in \mathbb{R})$

   Explain what the results tell you.

5. In many books, one finds the following "trick": To compute
   $$\ln(x) - \ln(x^*)$$
   for $x \approx x^*$, use the identity
   $$\ln(x) - \ln(x^*) = \ln\left(\frac{x}{x^*}\right).$$
   This is supposed to avoid subtractive cancellation. Compute
   $$\kappa(x, \ln) \text{ at } x = 1,$$
   Explain why the result casts doubt on the usefulness of the "trick."

6. If $\pi = 3.14159...$ is approximated up to a relative error of 0.05, what are the smallest and largest possible values of the approximation?

7. Suppose that y^* is a k-digit rounding approximation to y. Show that
   $$\left|\frac{y - y^*}{y}\right| \leq 0.5 \times 10^{-k+1}.$$

8. The Taylor expansion for $\log_e(1 + x)$ is given by
   $$\log_e(1 + x) = x - x^2/2 + x^3/3 - \cdots + (-1)^{k+1}x^k/k + \cdots$$
   Write a MATLAB function that takes as input a value for x, and a value for *tol*. The function must sum the series while the value of the current term is greater than or equal to *tol*.
   When executed, the function should display the value of x, the tolerance, the value of $\log_e(1+x)$ obtained by using your function, the exact value of $\log_e(1 + x)$ obtained using the MATLAB function **log**, and the absolute error:

   ```
   x=0.4    tol=0.01    myval=###    exact=###    error=###
   ```

   - Run the function four times using values of $x = 0.4$ and 0.83 and values of $tol = 0.01$ and 0.001.
   - Hand in a printout of the m-file of your function, and your execution and output for the assignment.
   - Email the TA `jsresh@@wpi.edu` your m-file.
     In the Subject of your email please put `MA3457 HW 1`