Homework #1

Math 4257/5257
Due Midnight, September 21

- Create a script file that performs calls the appropriate .m files for the following problems. Publish the report as an html file. Zip all the .m files, figures and html file together and upload zip file to the dropbox in D2L.

1. (12 points) Assume you are shopping for clothes, and there is a 10% discount for all items under $50, a 20% discount for items between $50 and $100 and a 30% discount for all items at or above $100. Write a function that inputs the original price and outputs the sales price, which discount was taken (10%, 20% or 30%), and total amount saved.

2. (12 points) Write a function called *maxi* which uses a *for* loop to find the most positive element in a vector. Have it input the vector and output the index of the most positive element and the actual value of the element.

3. (12 points) Write a function which takes inputs x, a, b, c, where x is a vector and a, b, c are scalars, and returns the values of
$$f(x) = ax^2 + bx + c$$
and
$$df(x) = 2ax + b$$

4. (10 points) Write a script that calls the function in Number 3 for 3 different sets of parameters a, b, c over the range $-1 \leq x \leq 1$.

5. (8 points) Create a function which evaluates whether a grade is passing (60 or above). If it is passing, display the comment 'passing grade' using the *disp* command.

6. (14 points) For computers, the machine epsilon ϵ can also be thought of as the smallest number that when added to one gives a number greater than 1. An algorithm based on this idea can be developed as

Step 1: Set $\epsilon = 1$

Step 2: If $1 + \epsilon$ is less than **or** equal to 1, then go to Step 5. Otherwise go to Step 3.

Step 3: $\epsilon = \frac{\epsilon}{2}$

Step 4: Return to Step 2.

Step 5: $\epsilon = 2 * \epsilon$

Write your own M-file based on this algorithm to determine the machine epsilon. Validate the result be comparing it with the value computed with the built-in function *eps*.