MATH 353: Engineering Mathematics III – Section 012

Spring 2013 (F.–J. Sayas) Homerwork #1 Due February 11 or 13

Very important. In this assignment, I'm asking you to write all your answers in the floating point format

$$0.m_1m_2...m_K \times 10^n, \qquad m_1 \neq 0,$$

no matter the format you get from Matlab or your calculator. As this very early stage of the course, you can give the answers to Matlab exercises by writing down what you have to do. You should check that your code works though.

1. (5 points) With arbitrary magnitude (any exponent is available) and precision of 4 decimal digits, store and compute the following quantities (each computation has to be carried out *after* storing the numbers that appear in it):

$$345789$$

$$345789 - 346810$$

$$1000 + 0.001$$

$$199998$$

2. (5 points) Find the roots of

$$x^2 + 4x - 10^{-20} = 0$$

with three digit accuracy. (Hint. Read Example 0.6 in the book.)

3. (5 points) Propose a good way of evaluating the function

$$\sqrt{x^2+2} - x$$

for large positive values of x. Test it with $x = 10^{10}$, using standard double precision. You are requested to do this by hand, but you can check your results with your computer as well.

4. (5 points) Write the Matlab instruction that produces the list

```
[0 -0.1 -0.2 -0.3 ... -2]
```

Have it assigned to a variable named `list`.

5. (5 points) Write the Matlab command that defines the function

$$u(x) = x^3 + 9x + 2$$

in a way that allows you to then write

```
u([0 1 2 3 4])
```

Write the result of this simultaneous evaluation.

6. (5 points) Here are two functions in Matlab

```
>> f = @(x) (x.*(x+1))./((x+0.5).*(x+1.5));
>> g = @(x) (x./(x+0.5)).*((x+1)./(x+1.5));
```

Write down the mathematical expression for these two functions. Give an explanation of why these two results differ:

```
>> f(10^200)
ans =
   NaN
>> g(10^200)
ans =
     1
```

`NaN` is Matlab for not-a-number. It is the typical Matlab answer to what you called an inderterminate result (or limit) in Calculus class ($0/0$, ∞/∞, $\infty - \infty$, 1^∞,...)

7. **All-or-nothing.** Your final task is the last one you will fulfill. With the solutions of your homework, visit my office (Ewing Hall 532), introduce yourself and turn your solutions in. Do it at the time when I have office hours (MW from 2pm to 4pm). If you cannot make it at any of those two times, you'll have to e-mail me to bring the homework to my office **before the deadline** (Wednesday, February 13 at 4pm).