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# BT 2020 — Numerical Methods for Biology

Jan–May 2019

## Assignment 1

9th February 2019

**Due date:** 17th February, 2019 @ 17:00

**Maximum marks:** 20

**Instructions:** Write MATLAB codes to solve the problems mentioned below. If you need any assistance, feel free to write to me or the TAs via Piazza (private note). Evaluation will be based on the codes and the logic.

**Academic Integrity:** You are allowed to discuss the problems verbally with your friends, but copying or looking at codes (either from your friend or the Web) is not permitted. Transgressions are easy to find, and will be reported to the “Sub-committee for the Discipline and Welfare of Students” and will be dealt with very strictly. Mention any collaboration (discussions only!) in your solutions.

**Late submission penalties:** 1 second – 24 h: 20%; 24–48 h: 40%; > 48h: 60%

**Early submission bonuses:** > 24h: 5%, > 48h: 10%, > 72h: 20%

### Hints:

1. Please have a look at the following page (from Cosma Shalizi’s blog), on minimal advice to undergraduates on programming: <http://cscs.umich.edu/~crshalizi/weblog/593.html>

### Problem Statement

- 1a. (5 marks) Write a function that computes the volume of a sphere, given the radius.
- 1b. (20 marks) Write a function that computes  $\sin(x)$  using the Taylor series, upto  $k$  terms (another input). Also, NEATLY print a table for the relative error in computation of  $\sin(\pi/6)$ , for values of  $k$  up to 10.
- 1c. (10 marks) Write a function that will print the following values, for floating point arithmetic of varying precisions, given the number of bits to use for  $s$ ,  $e$  and  $f$ :
  - Value of the smallest positive normalised floating point
  - Value of the largest positive normalised floating point
  - Smallest subnormal number

Your function should be something like this:

```
function printFloatValues(e, f)
% Print various floating point values for a given precision (e
  exponent bits and f bits for the mantissa)
...
```

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Sample output:

```
>>> printFloatValues(11, 52)
Realmin: 2{x}
Realmax: 2{y}
Eps (0): 2{z}
```

## How to Submit your Homework

- Submit your assignment ONLY via the submission link: <http://tinyurl.com/bt2020-submit>.
- You should not be signed into Dropbox while uploading this file (or use an incognito window to open the link), so that you can enter the following details during submission, instead of Dropbox auto-filling it:
  - First Name: Roll Number
  - Last Name: Your Full Name
  - E-mail: Your email id
- Save your solution files as hw1a.m and hw1b.m. Do not use different filenames!
- Each of your submission files, hw1a.m and hw1b.m should begin with the **header information** shown below — the number of the assignment, your roll number, your collaborators' roll number(s), and approximately how much time you took to solve the problems in that part of the assignment.
- **Submissions not adhering to any of the above instructions will not be evaluated.**
- Also do not send the files by e-mail — obviously, they will not be evaluated.

```
% BT2020 Assignment 1a
% Roll number: BE16B001
% Collaborators: BE16B002, BE16B003
% Time: 1:15
```

**Attention:** This assignment is fairly simple; the main purpose of this assignment is to ensure that you have installed MATLAB on your system and can write the simplest of programs. Most importantly, you should learn to adhere to the submission procedures, since we have a large class.