PHYS 2030 (Winter 2018) - HW 1

Due Date (hard copy in class): Jan. 10, 2017 11:30 AM

Questions

1. Take a screenshot of Matlab running on your computer (or a lab computer you are logged into). Make sure that it shows you printing a string that contains your name.

2. Briefly describe what each of the following are (within the context of Matlab) and how they differ from one another:

- command line
- script
- function
- structure
- toolbox
- cell
- string

3. Write a simple code that adds up all the integers between 1 and 100. [For novelty's sake, compare your method to that of Carl Gauss (`http://en.wikipedia.org/wiki/Carl_Friedrich_Gauss`), as legend would have it (`http://mathcentral.uregina.ca/QQ/database/QQ.02.06/jo1.html`)]

4. Consider the function

$$f(x) = a \tanh(bx) + c$$

where a, b, and c are constants[1].

- Find the derivative of $f(x)$ analytically.
- Write a Matlab code that visualizes $f(x)$, the analytic derivative you just computed, and a numerical estimation of the derivative (e.g., via finite differences). Note that you'll need to make some choice for a, b, and c.

[1] Hyperbolic tangents are surprisingly useful functions due to their **sigmoidal** nature and used in a variety of modeling situations. For example, the mechano-electro transduction properties of the sensory cells of your inner ear (*hair cells*) are well-described by a $\tanh$ function. Note that this is also sometimes referred to as a "*Boltzmann function*" via the connection to the cumulative distribution function of the Maxwell–Boltzmann distribution.