<u>CHM102</u> Assignment 2 (17-1-2017)

- 1. Shown below are a few functions. Which of them are eigenfunctions of the operator (d/dx).
 - a) sin (3x)
 - b) exp(-3ix)
 - c) $exp(\alpha x^2)$
- 2. Is the function $[(1/\pi)\sin(3x)]$ an eigenfunction of the operator: $[(-h^2/8\pi^2m)d^2/dx^2]$. If so, what is its eigenvalue?
- 3. The lowest energy electrons in a carbon nanotube can be described by the wavefunction given by $[\sin (\pi x/L)]$, where L is the length of the nanotube. (We will later learn in class as to how to arrive at this wavefunction.) For now,
 - a) Normalize this wavefunction.

b) Using the normalized wavefunction, calculate the probability of finding an electron between x=L/4 and x=L/2?

c) Using the normalized wavefunctions, calculate the expectation value for the **kintetic energy** of the electron.

- 4. Which of the following operators given below are Hermitian:
 - a) $-(d^2/dx^2)$
 - b) -i(d/dx)
 - c) (d/dx)
- 5. Check if the two operators (d^2/dx^2) and (x^2) commute.