Due Wednesday 1/17 in class.

1. McIntyre 2.17
2. McIntyre 5.11
3. Implement the "shooting method" to find the first and second energy eigenvalues and eigenfunctions of the harmonic oscillator potential, which has $U(x) = \frac{1}{2} m\omega^2 x^2$. Use the Mathematica notebook on the "Links" page of the class web page. Describe how you implemented the algorithm. What constants did you set equal to unity? Show the sensitivity of the solution to eigenvalues.
4. Solve the energy eigenvalue equation analytically to find the bound state energy eigenvalue and eigenfunction (there is only one bound state) of the potential energy $U(x) = -\lambda\delta(0)$ where λ is a positive constant with dimensions of [energy x length] (why these dimensions?). What does "bound state" imply about the energy eigenvalue?
5. Fill in the table that describes the different representations of the operators, eigenvalues, eigenstates *etc*. for a quantum particle subject to a 1-dimensional infinite square well potential energy (p. 2). This review question is "the two-times-table" of quantum mechanics! You should be able to write down any of the entries from memory at any time, almost reflexively.

A future project will be to fill in a similar table for the 1-dimensional harmonic oscillator potential, so start to generate this table.

1-d infinite well potential energy	Ket Representation	Matrix Representation	Wave Function Representation	Graph Representation
Hamiltonian				
Eigenvalues of Hamiltonian				
Normalized eigenstates of Hamiltonian				
Coefficient of n^{th} energy eigenstate				
Probability of measuring E_n				
Expectation value of Hamiltonian				