Due: Friday, 9/26, 2:10pm, PHYS360 Assignment 4
Reading:

1. Griffiths, Ch.2, **read pg. 56-78**. Note: We skipped the "Analytic Method" (pg 51-56), but **do read page 56** (starting with "In general, …") **and page 57** of that section.
2. Prepare for Reading Quiz: Friday, 9/26, questions on anything in Griffiths, pages 56-78, but especially:
   a) given a table of Hermite polynomials, be able to construct $\psi_n(x)$
   b) be able to define terms:
      wave packet
      Fourier transform
      group velocity
      phase velocity
      dispersion relation
      turning points
      bound state
      scattering state
      tunneling
      Dirac delta function
   c) understand the discussion on the bottom half of page 75
   c) be able to write down both time dependent as well as time independent Schr. Eq. from memory.

Problems:

1. Problem 2.11, pg. 50

2. If an arbitrary initial state function for a particle in a one-dimensional infinite well is expanded in the discrete series of stationary states of the infinite well, one obtains:

$$\Psi(x,0) = \sum_{n=1}^{\infty} c_n \psi_n(x)$$

On the other hand, if the particle is free, its Hamiltonian has a continuous spectrum of energies and any arbitrary initial state is a superposition of $\psi_k(x) = e^{ikx}$ expressed as an integral:

$$\Psi(x,0) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} \phi(k)\psi_k(x)dk$$

a) What are the dimensions of $|c_n|^2$ and $|\phi(k)|^2$, respectively?
b) If there is a difference in dimensionality, why is that so?
c) What are the dimensions and the physical interpretation of the integral $\int_{-\infty}^{\infty} |\phi(k)|^2 dk$?

3. Problem 2.21, pg 67 SCROLL TO THE NEXT PAGE

4. Problem 2.22 part a), b), and c), pg 67
5. Problem 2.23, pg 76
6. Problem 2.27, pg 77