Physics 471 – Fall 2008

Homework #3, due Friday, September 19

1. Griffiths problem 2.5
   This problem is rather long, especially part (c). Use the following trigonometric identities: $\sin^2(x) = \frac{1}{2}(1-\cos(2x))$ and $\sin(x)\sin(y) = \frac{1}{2}(\cos(x-y) - \cos(x+y))$
   and use the integrals shown on the inside back cover of your textbook.
   If you really don't like doing integrals, here is the most difficult one, from Mathematica:
   $$\int_0^a x \sin\left(\frac{n\pi x}{a}\right)\sin\left(\frac{m\pi x}{a}\right)dx = \frac{a^2}{2\pi^2}\left(\frac{\cos((m-n)\pi)-1}{(m-n)^2} + \frac{1-\cos((m+n)\pi)}{(m+n)^2}\right) \text{ for } m,n \text{ integers}$$

2. Griffiths problem 2.7.
   Hint: Draw pictures of the first few stationary states of the infinite square well, and compare them with $\Psi(x,0)$. Can you eliminate some of the c_n coefficients just by symmetry?
   For part (d), you can use Mathematica to evaluate the infinite sum, or just leave it as a sum.

3. Griffiths problem 2.10.

4. Griffiths problem 2.11. Do this problem ONLY for ψ_0. It's too long otherwise.