INFINITE SQUARE WELL

Problem 3.36

(a) Refer to Problem 2.6. If you measured the energy of this particle, what values might you get, and what is the probability of each? Use the answer to calculate the expectation value of H, and compare the answer you got before.

2.20, 6.26

$$\Psi(x,t=0) = \frac{1}{\sqrt{2}}[\psi_1(x) + \psi_2(x)] \quad \text{where } \psi_n(x) = \sqrt{\frac{2}{a}}\sin\frac{n\pi x}{a}$$

Possible energies are $E_n = \frac{n^2\pi^2\hbar^2}{2ma^2}$

$E_1 =$ ________ $= \lambda_1$ $\qquad E_2 =$ ________ $= \lambda_2$

$c_1^{1/2} =$ (Probability of E_1) = ____ , $c_2^{1/2} =$ (Probability of E_2) = ____

[3.134] / 108 $\quad \langle H\rangle = \sum \lambda_n |c_n|^2 = \sum E_n |c_n|^2$

$=$

This is a *much* easier way to find the energy expectation value than what we did in 2.6:

$$\langle H\rangle = \int_0^a \Psi^* H \Psi\, dx$$

$$= \frac{1}{2}\int (\psi_1 e^{i\omega_1 t} + \psi_2 e^{i\omega_2 t})(E_1\psi_1 e^{-i\omega_1 t} + E_2\psi_2 e^{-i\omega_2 t})\,dx$$

$$2\langle H\rangle = E_1\int \sin^2\frac{\pi x}{a}dx + E_2\int \sin^2\frac{2\pi x}{a}dx + [(E_1 e^{i3E_1t/\hbar} + E_2 e^{-i3E_1t/\hbar})]\int \psi_1(x)\psi_2(x)\,dx$$

$= \dots$