PHYS 451: Quantum Mechanics I - Spring 2017
Homework #2, due Tuesday January 31 in class

Wave function, expectation values, stationary states

1. Problem 1.17 in Griffiths.

2. A certain system is in the folowing stationary state:

$$\psi(x) = A\exp(-\beta x^4).$$

   where A and β are some real constants. Find the energy of the state and system's potential energy function, $V(x)$. Make a sketch of $V(x)$.

3. Problem 2.2 in Griffiths.

4. A particle moves in a 1D infinite square well ($0 \le x \le a$). Its wave function at $t = 0$ is

$$\psi(x, t = 0) = \sqrt{\frac{8}{5a}}\left[1 + \cos\left(\frac{\pi x}{a}\right)\right]\sin\left(\frac{\pi x}{a}\right)$$

   (a) What is the wave function at time $t > 0$?

   (b) What is the average energy at time $t = 0$ and $t > 0$?

   (c) What is the probability of finding the particle in the left half of the box at $t > 0$?