

Phys 3810, Spring 2013  
Problem Set #2

1. *Griffiths*, 2.37
2. *Griffiths*, 2.10
3. *Griffiths*, 2.11
4. *Griffiths*, 2.15
5. *Griffiths*, 2.19
6. *Griffiths*, 2.21

7. Using Maple or the computer-math system of your choice, plot the square of the wave function for the 50<sup>th</sup> stationary state of the QM harmonic oscillator.

We'll use Eq. (2.85) of course, but if all we want is the appearance of the graph (to get a picture like Fig. (2.7) in the book) we don't need a specific  $m$  and  $\omega$  because we can use the unitless variable  $\xi$ . We also don't need to worry about the normalization. So we just need to use the terms of (2.85) which depend on  $\xi$ . With these, the plot needs to go from about  $\xi = -20$  to  $\xi = 20$ . (You decide how to show it the best.)

Recall in Maple to define a function, do (like):

```
f(x) := 4*x^3+ 3*x^2 -8;
```

The Hermite polynomials are available in Maple with the function

```
HermiteH(n, x)
```

And to plot your defined function  $f(x)$ , do like:

```
plot(f(x), x=-10..10);
```

Let's show Griffiths that he's not such a tough guy with his impressive-looking Fig. (2.7). You may want to try the 100<sup>th</sup> state, and... hell, get the 1000<sup>th</sup> state!

Note, for all integrals on this set you can use tables or Maple or whatever. But you *should* say where you got some non-obvious result, e.g. a reference number in a table of integrals if you looked it up.

The Gaussian integrals given in the inside back cover of the book come up quite a bit! You don't need to reference those.