

Quantum Physics, Preparation for Tuesday, Apr. 2

Study the Remainder of Chapter 12

You have studied a few exact solutions of Schrodinger's equation far more than Moore is expecting you to have when reading Sections 12.4 to 12.7. They should be much easier and more intuitive as a result.

However, the numerical ideas in Section 12.4 are new and important — so important that Moore took the unusual step of writing out Eq. 12.12 twice.

Plan for Class

I have been in NM working on telescope gear for five days, and I apologize for the inattention, and in particular for the lateness of this document. I hope the problem set is fairly straightforward for you.

We have three things we can do for Tuesday's class. Not all will fit, I don't think. Please come prepared to prioritize:

(1) The two-dimensional rotationally-symmetric Schrodinger equation is a gateway to the three-dimensional rotationally symmetric one. We could study how it is solved.

(2) We could spend lots of time on 12.4 and 12.5, which is how numerical solutions of Schrödinger's equation are done

(3) We could spend time on 12.6 and 12.7, qualitative graphical solutions of Schrödinger's equation and the application of qualitative methods to tunneling

Also, come ready to decide, do you feel ready to leave the gruelingly mathematical work on Schrödinger equation behind and turn to nuclear physics on Friday?

PROBLEM SET 14 ON REVERSE

For Problem Set 14

The Idea of Local Wavelength

1. Understand and write out Ex. Q12X.1, p. 186 — personally, I think of the inverse of wavelength as a measure of curvature — large wavelength is low curvature — short wavelength is high curvature — in any case, it is a way of conceptualizing the second derivative of the wave function

The Numerical Approach to Schrödinger's Equation

2. Derivation Q12D.1, p. 198 — Moore is doing a more extensible version of a derivation we have done in class — by more extensible, I mean that it can be used to get better and better approximations to derivatives when you are studying a function that is defined on only discretely-spaced points
3. Understand and write out Ex. Q12X.3, p. 187 — this is a totally straightforward and fast but important exercise — it is in the guts of what SchroSolver is doing

Using SchroSolver (Requires Web Access) Basic

4. , Q12B.1, p. 197 — uses the web app at <http://physics.pomona.edu/sixideas/SchroSolver/>

Sketching and Comparing with SchroSolver (also Requires Web Access) Intermediate

5. Q12M.3, p. 197 a multi-part problem where you both sketch and use SchroSolver to examine the Hydrogen atom radial solutions.