Problem Set 4

Physics 234 Spring Quarter 2004 H.J.Frisch HEP320 (702-7479)
April 19, 2004 Office Hours:Wed, Fri after class
(Other times possible- please call before coming over).

Due Monday, April 26 (hand in at class).

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Reading: Shankar, Chapter 4, Section 4.3; Chapter 5, Sections 5.1-5.5 (i.e to the end).
To get the maximum out of the reading, I suggest:

1. Please take notes as you read;
2. Work through the problems in a small group before writing out the solutions yourself.

Optional Reading: Feynman, Vol. 3, Chapters 5 and 6. French and Taylor is excellent on the wave mechanics of potential wells, barriers, etc; I highly recommend it. Also, if you're interested in Bell's Inequalities and questions of non-locality and trans-luminal information transfer, the references in the Kwiat and Hardy article are a very nice set to work through one-at-a-time.

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Midterm: the Midterm will be in class on May 5th.

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Problems:

1. **The Free Particle Wave Function**: Shankar, Exercise 5.1.2. How would you describe this solution physically?
2. **Time Evolution of a Gaussian Wave Packet**: Shankar, Exercise 5.1.3. (Remember this form of the propagator, please: also note Ehrenfest's theorem and equ. 5.1.17)
3. **The Sudden Approximation**: Shankar, Exercise 5.2.1.
4. **A Delta-Function Potential**: Shankar, Exercise 5.2.3.
5. **The Continuity Equation and Probability Current Density**: Shankar, Exercise 5.3.4.
6. **Scattering From a Delta-function Potential**: Shankar, Exercise 5.4.2.
7. *The Mystery of the Quantum Cakes* describes a 'toy' entangled system. Using the wave-function given in Appendix A, calculate the probability that both cakes taste Bad.