Physics 228 - Winter 2008

HW III

Due Friday 1/25/08

All problems are in the class text by Boas, except as noted.
Example problems: *Not to be turned in – solutions can be found in the back of the text, or in Appendix B.*

§7.9: 2, 5, 6, 9, 15
§7.11 5, 9
§7.12: 4, 6, 11, 16, 18, 22
§7.13: 2, 3. 7, 10

Assigned problems: *To be turned in. Five problems chosen at random from those assigned in Boas below will be graded and are worth 5 points each. Problem A is extra credit: doing extra credit problems can make the difference in borderline grade assignments. (Regular HW points are not the same as Extra Credit points.)*

§7.7: 10
§7.9: 3, 8
§7.12: 3, 9, 21
§7.13: 4
§7.13: 6, 9, 13 [HINT: Recall the theorem of Parseval. This series is the Riemann Zeta Function, $\zeta(2)$, $\zeta(n)=\sum_{k=1}^{\infty} k^{-n}$].

A. (Extra Credit – 1 pt) Here we combine exercises in HW II to practice using *Mathematica* and think more about the Gibbs phenomenon. Consider the function $f(x) = x$ on the interval $-\pi < x \le \pi$, repeated over the real line with period 2π.

   a) Using Mathematica make a plot of this function over 2 periods ($-2\pi \le x \le 2\pi$).

   b) This is an odd function, so it will have a Fourier sine series expansion. Use *Mathematica* (*i.e.*, use *Mathematica* rather than doing it analytically) to find the Fourier coefficients for this expansion.

c) Plot the sum of the first 2, 5, 10, and 50 terms in this series on the interval $-2\pi \leq x \leq 2\pi$.

d) Notice that with the first 50 terms, you can reproduce the function very well, except for near the sharp corners. Why do you think that is?

Note: Problem sets must be turned in by the end of class or be in Steve Ellis's Physics Department mailbox by 12:20 PM on the date indicated. Late problem sets are accepted for 1 week with a 50% discount. Solutions will be posted on the web.