

PHGN511 Homework #13 (last one!)
Due Wednesday, December 8, 2004 at the beginning of class
Show your work.

- 1) Butkov 12.1
- 2) Butkov 12.11 (here you are doing some work based on the prior problem and getting practice in 2-d Green's functions. You can just assume the 2-d Green's function form in problem 10 is correct. It isn't hard to show this form, however. You just use Gauss' law with a line charge, and then integrate to get the electrostatic potential).
- 3) We want to find the Green's function for the differential equation

$$\frac{\partial^2 \Phi}{\partial x^2} - k_0^2 \Phi = f(x) \text{ with the boundary conditions } \Phi(\pm\infty) = 0.$$

- a) Obtain the Green's function by direct construction.
- b) Now, using a Fourier transform approach, show that

$$G(x, x') = -\frac{1}{2\pi} \int_{-\infty}^{\infty} \frac{e^{ikx'} e^{-ikx}}{k_0^2 + k^2} dk$$

- c) Evaluate this integral and show you obtain the same result as in part a.