

PHGN511 Homework #1
Due Friday, Sep. 3, 2004 at the beginning of class
Some review of complex numbers
Show your work on all problems

- 1) Butkov problem 2.2
- 2) Butkov problem 2.6 (the first part has a bit of algebra to get it into the form of a hyperbola)
- 3) Butkov 2.8 (why not let Mathematica do the Algebra?)
- 4) Butkov 2.12
- 5) Butkov 2.20 (again, I suggest you practice your Mathematica here although its easy by hand. Be careful to look at all the things that must be satisfied to have an analytic function).
- 6) Show that:
 - a) $e^{\ln z}$ always equals z
 - b) $\ln e^z$ does not always equal z
- 7) A plane wave of light of angular frequency ω is often represented as:

$$e^{i\omega(t-nx/c)}$$

where x is the position, t is time, n is the index of refraction, and c is the speed of light. We tend to think of n as real, but in some materials, n is replaced by the complex quantity $n-ik$. What is the effect of k on the wave? What does k correspond to physically? This is an important example of something that is common in physics: the generalization of a quantity from real to complex.