PHZ3113–Introduction to Theoretical Physics

Fall 2008

Problem Set 14

Nov. 7, 2008

Due: Friday, Nov. 14, 2008
Reading: Boas Ch. 14

1. (1 pt.) Show whether the function $f(z) = \mathrm{Re}\, z$ is analytic or not.
2. (1 pt.) Find the analytic function $w(x, y) = u(x, y) + iv(x, y)$ if $u(x, y) = x^3 - 3xy^2$.
3. (1 pt.) Suppose $f(z)$ is analytic. Show that the derivative of $f(z)$ with respect to z^* does not exist unless $f(z)$ =const.
4. (2 pts.) Let $w = w(x, y)$, and $A = \partial^2 w/\partial x^2$, $B = \partial^2 w/\partial x \partial y$, and $C = \partial^2 w/\partial y^2$. From the calculus of functions of 2 variables, we have a saddle point if

$$B^2 - AC > 0. \tag{1}$$

With $f(z) \equiv u(x, y) + iv(x, y)$, apply Cauchy-Riemann conditions and show that neither $u(x, y)$ nor $v(x, y)$ has a maximum or minimum in any finite region of the complex plane.