

**PHYSICS 301**  
**2<sup>nd</sup> HOMEWORK**  
**Dr. V. Lempesis**

**Hand in: Tuesday 10th of March 2015**

**Student Name:** \_\_\_\_\_

**Student ID:** \_\_\_\_\_

1. a) Show that the function  $u = 2x(1 - y)$  is harmonic. b) Find a function  $v$  such that the function  $f(z) = u + iv$  is analytic. c) Express  $f(z)$  as a function of  $z$ .
2. Find the derivative of the complex function  $f(z) = z^3$ , using the definition of the derivative.
3. The function  $f(z) = \sinh(4z)$  is analytic. Verify the Cauchy – Riemann conditions.
4. Using the rules of differentiation find the derivative of the function.  $f(z) = 3z^{-2}$ , at the point  $z = 1 + i$ .