

MATH 4103

Quiz 5

Spring 2016

Name: _____

Problem 1. [1+1+1 points]

In all parts of this problem you will consider the function

$$f(z) = e^{iz} .$$

(a) Without writing z as $x + iy$, find $f'(z)$.

(b) If $z = x + iy$ and $f(z) = u(x, y) + iv(x, y)$ are the decomposition of z and $f(z)$ into real and imaginary parts, do the following:

– write down the explicit expression for $u(x, y)$;

– explain why $u(x, y)$ is a harmonic function (i.e., satisfies the equation $u_{xx}(x, y) + u_{yy}(x, y) = 0$), *without computing any derivatives of the function $u(x, y)$.*

(c) Find the harmonic conjugate of the function $u(x, y)$ from part (b), *without computing any integrals!* Explain briefly how you did that.