

# Math 4213 - Complex Analysis

Quiz #6 - 2012.01.27

Solutions

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1. What can the Cauchy-Riemann equations help to determine about a complex valued function?

The Cauchy-Riemann equations can be used to help determine whether or not a function is differentiable.

2. Compute the image of the line  $\{(x, y) \mid y = x \in \mathbb{R}\}$  under the mapping  $w = z^2 + 2$ .

The line can be parametrized by  $z = x + ix$ , for  $x \in \mathbb{R}$ . Plugging this into the mapping  $w$  gives

$$\begin{aligned}w(x + ix) &= (x + ix)^2 + 2 \\ &= 2 + i2x^2\end{aligned}$$

So the real part is  $u = 2$ , and the imaginary part is  $v = 2x^2$ . Since  $x \in \mathbb{R}$ , we get that the image of the line  $y = x$  is the vertical line at  $u = 2$  which extends in the positive imaginary direction only. In other words, the set is  $\{(u, v) \mid u = 2, v \in [0, \infty)\}$