

# Math 4213 - Complex Analysis

Quiz #21 - 2012.04.02

Solutions

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1. To define a unique bilinear transformation, how many points are needed?

Three points are needed.

2. State which contour to use to compute the following integral:

$$\int_{-\infty}^{\infty} \frac{x^2}{(x^2 - 1)(x^2 + 4)^2} dx$$

The integrand is a rational function with two zeros on the  $x$ -axis, which are simple, and two zeros off the  $x$ -axis, which are of degree 2. Furthermore, the degree of the denominator is at least two more than the degree of the numerator. Therefore, we can use contour which is the the upper  $1/2$  semi-circle of radius  $R$  as  $R \rightarrow \infty$  and the indented contour along the  $x$ -axis, where the indentations are at  $x = 1$  and  $x = -1$ .