Math 4213 - Complex Analysis

Quiz #17 - 2012.03.14

Solutions

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1. Define the simple closed contour which can be used to compute integrals of the form:

$$\text{P.V.} \int_{-\infty}^{\infty} \frac{P(x)}{Q(x)} \cos(x)\, dx, \quad \text{P.V.} \int_{-\infty}^{\infty} \frac{P(x)}{Q(x)} \sin(x)\, dx,$$

where the degree of the polynomial Q is at least one greater than that of P.

We use the contour which consists of the real axis and the upper half semi-circle, which can be thought of as the limit as $R \to \infty$ of the two contours

$$\mathcal{C}_x = \left\{ x \middle| -R \leq x \leq R \right\}, \quad \mathcal{C}_R = \left\{ Re^{i\theta} \middle| \theta \in [0, \pi] \right\}$$