

Complex Analysis

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- (1) Put  $z = x + yi$ . Find the image of the region  $0 \leq x \leq \pi$ ,  $y \geq 0$  for the map

$$w = e^{iz}.$$

- (2) Evaluate

$$\int_{-\infty}^{\infty} \frac{dx}{x^2 + 1}.$$

- (3) Choose the constants  $a$  such that the following functions are harmonic

$$u(x, y) = e^{x^2 - y^2} \cos(axy).$$