

Math 121A Spring 2015, Sample Midterm 2

1. Find all possible values of $(-2)^{-1}$, $(-2)^{1/4}$, and $(-2)^i$. How many distinct values are there in each case?
2. Find all zeros of the function $f(z) = \cos(z)$, with justification.
3. Evaluate the integrals

$$\oint_{|z-2|=1} \bar{z} dz, \quad \oint_{|z|=1} \frac{e^{z^2}}{(2z-1)^2},$$

both oriented positively.

4. Locate the singularities of the following function:

$$f(z) = \frac{e^{\pi/z}}{(z-\pi)^2}.$$

Classify them as poles (state the order) or essential singularities, and calculate the residue at each pole.

5. Evaluate the following integral:

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