

MAT 342, Homework 12 due WEDNESDAY, DEC 4

From the textbook: questions **6, 7, 10** p. 254-255; questions **3, 5** p. 264-265; question **2** p. 273.

In question **6 p.254**, please do the part that expresses the integral over C_N as a sum. The second part of the question (starting with the words “Then, using the fact..”) that computes the sum of the series is optional but recommended. You will get a pretty cool result if you do the optional part.

More questions:

1. For each of the following functions, find all the poles and find the residue at each pole. Also find all the zeroes and determine the order of each zero.

$$(a) \ f(z) = \frac{z}{\sin z} \qquad (b) \ g(z) = \frac{z^2}{z^4 + 9}$$

2. Consider the function

$$f(z) = z^5 \left(1 - \cos \left(\frac{1}{z} \right) \right).$$

Is this function bounded in a small disk $|z| < \delta$ near 0? Does it have a finite or infinite limit at 0? Is there anything else you can say about the behavior of this function near 0?