

The University of Waikato  
Department of Mathematics

Advanced Calculus math311-04A 2004 Complex Assignment 3

Due Thursday 27<sup>th</sup> May: Please hand back your completed assignment through the slot outside the Mathematics Office G3.19. It should be written up neatly and on no more than four sides of an A4 page or the equivalent.

1. Find the first 5 terms of the power series for  $e^z$  and  $\sin z$  about  $z = 0$  and then the series for  $e^z \sin(z)$  by multiplication. What is the radius of convergence of this latter series ?

2. Find the center, radius of convergence and circle of convergence of the power series

$$f(z) = \sum_{n=1}^{\infty} \frac{(-1)^n (z+4)^n}{n5^n}.$$

Examine the convergence, or otherwise, of the series on the circle of convergence.

3. If the following function  $f(z)$  was expanded in a power series about the point  $z = 2 + 2i$  what would be the radius of convergence? Do not perform the expansion.

$$f(z) = \frac{z}{(z-1)(z+4)}.$$

4. Find and classify the zeros and singularities in the finite complex plane for the function

$$f(z) = \frac{z^3 \sqrt{z+4}}{(z+i)^2 (z-2)}.$$

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20th May 2004