

The University of Waikato
Department of Mathematics

Advanced Calculus math311-04A 2004 Complex Assignment 2

Due Thursday 20th 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. Let $f(z) = \sqrt{z(z+i)}$. Find a domain in \mathbb{C} including $z = 2$ on which f is single valued and satisfies $f(z)^2 = z(z+i)$. Evaluate $f(2)$.

2. Investigate the integral

$$\int_{\Gamma} \frac{1}{z} dz = 2\pi i$$

where Γ is the unit circle, by considering its real and imaginary parts and computing the two line integrals.

3. Evaluate the integral

$$\int_{\Gamma} \frac{z+3}{(z+i)(z+2)} dz$$

where Γ is a circle of radius 1 and centre $-i$, by using partial fractions, Cauchy's theorem, and parametric evaluation.

4. Explain how $\sin z$ differs from $\sin x$ by examining its variation in

the complex plane along lines parallel to the x and y axes for example. Is $|\sin z|$ bounded ?

Kevin Broughan
13th May 2004