Complex Analysis

Math 214 Spring 2004 — Fowler 316 MWF 3:30pm - 4:25pm

 — http://faculty.oxy.edu/ron/math/312/04/

Class 30: **Friday April 9**

SUMMARY Applications of Residues to Real Integrals
CURRENT READING Saff & Snider, §6.2

The beauty of Complex Residue Calculus is that it allows us to evaluate a vast number of contour integrals. In fact, we can show that we can use residues to evaluate associated **real** integrals which would otherwise be very difficult to get exact values for become quite easy as contour integrals.

Recall the definition of $z = e^{i\theta} = \cos(\theta) + i\sin(\theta)$ Therefore, we can write $\cos(\theta)$ and $\sin(\theta)$ in terms of z.

EXAMPLE

Rewrite the integral $\displaystyle\int_0^{2\pi} \frac{d\theta}{3 + 2\sin\theta}$ in terms of z, using $z = e^{i\theta}$ where $0 \le \theta \le 2\pi$.

Evaluate the real integral by evaluating the contour integral.

GROUPWORK

Show that $\displaystyle\int_0^{2\pi} \frac{\cos 3\theta}{5 - 4\cos\theta} d\theta = \frac{\pi}{12}$

Saff & Snider, page 318, #9. Show that $\displaystyle\int_0^{2\pi} (\cos\theta)^{2n}\, d\theta = \frac{\pi(2n)!}{2^{2n-1}(n!)^2}$