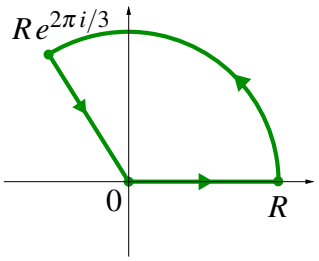
MAT342 Homework 11

Due Wednesday, May 1

1. Use residues to show that $\displaystyle\int_{-\infty}^{\infty} \frac{dx}{(x^2+1)^2} = \frac{\pi}{2}$.

2. Using residues, show that $\displaystyle\int_{0}^{\infty} \frac{x^2\,dx}{(x^2+9)(x^2+4)^2} = \frac{\pi}{200}$.

3. Using a contour like the one at right with R sufficiently large, show that $\displaystyle\int_{0}^{\infty} \frac{dx}{x^3+8} = \frac{\pi}{6\sqrt{3}}$.



4. Using residues, show that $\displaystyle\int_{-\infty}^{\infty} \frac{\cos 5x}{x^2+1}\,dx = \frac{\pi}{e^5}$.

5. Use residues to calculate $\displaystyle\int_{0}^{\infty} \frac{x^3 \sin x}{(x^2+1)(x^2+9)}\,dx$.