PH3103 Mathematical Methods of Physics
Autumn Semester - 2025
Indian Institute of Science Education and Research, Kolkata
Instructor: Koushik Dutta

Homework: 5 Submission Date: 8/09/2025

The hand written solutions must be submitted at the start of the class

1. Evaluate the following integral
$$\int_0^\infty \frac{sin\ x}{x(x^2+a^2)}, \quad a>0. \tag{1}$$

2. Evaluate the following integral
$$I = P\int_{-\infty}^{\infty} \frac{dw'}{(w'-w)[(w'-w_0)^2+a^2]} \tag{2}$$

3. Evaluate the following integral
$$\int_0^{2\pi} \frac{d\theta}{a+bcos2\theta} \tag{3}$$

4. Evaluate the following integral
$$\int_0^{2\pi} \frac{cos\ n\theta\ d\theta}{5-4cos2\theta} \tag{4}$$

5. Find the residues at the poles of
$$f(z) = \frac{z^2+2}{z^2(z^2+1)} \tag{5}$$
$$g(z) = \frac{cosz}{sin^2 z} \tag{6}$$