Course 2BA1: Trinity Term 2003.

Assignment V.

To be handed in by Wednesday 30th April, 2003.
Please include both name and student number on any work handed in.

1. Find the general solution of the differential equation

\[ \frac{d^2y}{dx^2} - 6 \frac{dy}{dx} + 58y = x \sin 2x. \]

Find also the solution satisfying \( y(0) = y(\pi) = 0 \).

2. Let \( f: \mathbb{R} \to \mathbb{R} \) such that

\[ f(x) = 4(x - m) \text{ if } m \leq x \leq m + \frac{1}{2} \text{ for some integer } m; \]

\[ f(x) = 4(m + 1 - x) \text{ if } m + \frac{1}{2} \leq x \leq m + 1 \text{ for some integer } m. \]

Express the function \( f \) as a Fourier series of the form

\[ f(x) = \frac{1}{2}a_0 + \sum_{n=1}^{\infty} a_n \cos 2\pi nx. \]