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**Assignment II**  
**Introduction Partial Differential Equations**  
**for students Mathematics and Physics**

Afdeling Wiskunde  
Faculteit der Exacte Wetenschappen  
Vrije Universiteit Amsterdam

Due: Thursday November 17, 2005.

Instructions: include input and output; *motivate all answers*.

Individual assignment, written in English.

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Consider the partial differential equation

$$u_t = -u_{xxxx},$$

with boundary conditions  $u(t, 0) = u(t, \pi) = 0$ , and  $u_{xx}(t, 0) = u_{xx}(t, \pi) = 0$ , and initial condition  $u(0, x) = f(x)$ .

1. Find the general solution of the above equation using separation of variables.
2. Consider the initial function  $f(x) = \frac{x-\pi}{2}$ , and compute the solution.
3. Use MAPLE or MATHEMATICA to plot snapshots of the above solution for  $t = 10^{-4}, 10^{-3}, 10^{-2}, 10^{-1}, 1, 10$ . Give the graphical output. Carry out the MAPLE or MATHEMATICA calculations with 10 and 100 Fourier modes respectively. What conclusion can you draw concerning the accuracy of the Fourier series?

*Good luck*