

Math 3150-4 – PDEs for engineers
Computer lab – 01/23/2012

Here is the program for today's computer lab. The purpose of this computer lab is to familiarize you with the computing facilities available for our class and with Matlab.

1. All students have an account in the Math Department computer system. If this is the first time using your account, you need to follow the instructions in the back of this sheet or in the class website.
2. (§1.2) Consider the one dimensional wave equation

$$\begin{aligned}u_{tt} &= u_{xx}, \quad t > 0, \quad x \in [0, 1] \\u(0, t) &= u(1, t) = 0, \quad t > 0 \\u(x, 0) &= f(x), \quad x \in [0, 1] \\u_t(x, 0) &= 0, \quad x \in [0, 1].\end{aligned}\tag{1DWEQ}$$

We showed in class that the functions

$$u_n(x, t) = \sin(n\pi x) \cos(n\pi t), \quad n = 1, 2, \dots$$

solve (1DWEQ) with initial position of the string $f(x) = \sin(n\pi x)$.

- (a) Produce a plot with snapshots of the solution to (1DWEQ) with

$$f(x) = \sin(2\pi x)$$

at times $t = 0, 1/6, 1/3, 1/2$.

- (b) Produce a plot with snapshots of the solution to (1DWEQ) with

$$f(x) = \sin(\pi x) - \frac{1}{2} \sin(2\pi x) + \frac{1}{3} \sin(3\pi x)$$

at times $t = 0, 1/4, 1/2, \dots, 2$.

3. (Example 2.2.1) Consider the 2π -periodic function,

$$f(x) = \begin{cases} \frac{1}{2}(\pi - x) & \text{if } 0 < x \leq 2\pi \\ f(x + 2\pi) & \text{otherwise.} \end{cases}$$

Its Fourier series is given by:

$$f(x) = \sum_{n=1}^{\infty} \frac{\sin(nx)}{n}.$$

Produce a plot with $f(x)$ and the approximations obtained by truncating the Fourier series to $N = 1, 2, 5, 10, 15$ terms.

———— Only if you have never accessed your class account ————

Class Accounts

Your login name will be of the form c-azbc, where ‘a,’ ‘b,’ ‘c’ are your last, first, and middle initial, respectively and ‘z’ is the last letter in your last name. For example, if your name is Ulysses Attila Eratosthenes, your login name will be c-esua. (Many people have the same initials, to ensure your login name is unique, a digit may be added after the initials, eg. c-esua1, c-esua2, ...). For people with more complex (eg. hyphenated names) only the first character of each name is used.

Passwords

Your initial password will be the letters as in the login name, followed by the last four digits of your University ID number (e.g., if your UID is 123456789 and your login name is c-esua, then your password is esua6789) or if the login name is c-esua2 the password is still esua6789).

Upon first logging in you should change your password. To do so, log in, type “passwd (followed by RETURN), if there is a problem here try typing “passwd followed by your username (eg. “passwd c-esua). Next type your old password (the one you used to login), and then type your new desired password twice as instructed. Your new password is effective within 30 minutes. If you forget your password, request a new one (from the Lab Assistant). Your password must consist of at least 6 characters (upper and lower case letters, and digits). You should take care to choose one that is very difficult to guess, and keep it to yourself!