Massachusetts Institute of Technology
Department of Mechanical Engineering

2.003J/1.053J Dynamics & Control I

Fall 2007

Homework 2

Issued: Sep. 14. 2007 **Due**: Sep. 21. 2007

Problem 2.1 : Matrix creation with loop

i) Create a 5×5 matrix in which each element has a value equal to the sum of its row and column numbers.

ii) Create a 5×5 matrix in which each element has a value equal to the square of the sum of the element's row and column numbers.

Problem 2.2 : Matrix creation with conditional

Make a one dimensional array that contains all integers in the range of 1 to 100 that are not divisible by 2, 3, and 7.

Problem 2.3 : Velocity and acceleration profile calculation from the ball trajectory

Use the same trajectory file, `'ball.mat'` from the last homework. Time(`t`) and trajectory(`x`) are from the first and the second columns, respectively. Write an m-file to calculate the ball's velocity and acceleration in two different ways. You should follow the below guidelines to make m-file. (Otherwise, you may lose point.)

- You should submit **only** m-file through the MIT Server site.
- Your m-file name should be `'HW023_your_Kerberos_name'`(For example, it should be **`'HW023_ptso.m'`** with e-mail address of ptso@mit.edu**)**
- In the first line of m-file, `'function [v1,a1,v2,a2,t]=HW023'` should be added.
- You can also start by downloading and using the template m-file from the MIT Server site (HW023.m)

i) Write a “for” loop and calculate the difference between adjacent points. For examples,

$$v(i) \approx \frac{x(i+1) - x(i)}{t(i+1) - t(i)}$$

Velocity and acceleration should be assigned to the variables `'v1'` and `'a1'` respectively.

ii) Use the MATLAB function `'diff'`. Velocity and acceleration should be assigned to the variables `'v2'` and `'a2'` respectively.

Is this neighboring point approach good in the presence of noise? Explain it.