

CIEG 675

Homework #4 Due **Wednesday March 18, 2009 (NOTE THAT IS 2 WEEKS AWAY)**

In a m-file do the following and verify it works by copy and pasting into the command window or running your m-file.

- 1) Write a function that will take an integer, n, as input and then output the Fibonacci sequence out to that integer n. It will also plot the sequence as a function of its location in the sequence.
- 2) Write a function that will take an arbitrary, but smooth, vector of data and locate ALL the local maxima and minima in the vector. It should return the indices in the original vector of where these maxima and minima occur. Test your function on the following data set that you should make quite smooth by using small increments in x, where x should go from 0 to 10;

$$y = x^{1.01} + 4 \cos(3\pi x / 4) - 2 \sin(2\pi x / 3) - 0.25 .$$

Plot your function and then plot the maxima and minima on top as different symbols.

- 3) In coastal engineering an equation exists for linear wave theory to predict the wavelength (distance between 2 wave crests) as a function of wave period and water depth. Unfortunately the wave length exists on both sides of the equation. Write a function to determine the wave length for a specific wave period and water depth as input. It should output the wave length. The equation is

$$L = \frac{gT^2}{2\pi} \tanh\left(\frac{2\pi h}{L}\right),$$
 where L is wavelength in meters, g is gravitational acceleration, h is

water depth in meters and tanh is the hyperbolic tangent and is a built in function in matlab. As a first guess, use what is called the deep water value where the tanh term goes to 1. Check your code for a 10s wave in 20m depth. L= 121.2 m.

- 4) Test your function from problem 3 by making a plot of wave length as a function of water depth from 100m depth to 10 m depth for a 10 s wave. Test your function from problem 3 by making a plot of wave length as a function of wave period from 1 to 30 s for waves in 40 m deep water. Use 2 subplots
- 5) You are asked to write a simple function to parse out grades for your teacher's class. The code should divide the grades based on a standard scale as score >= 90 is an A, 80 >= score < 90 is a B, 70 >= score < 80 is a C, 60 >= score < 70 is a D and anything below is failing. For now, just return the indices of the A's, B's, C's and D's. Later we can use

something called a structure or come up with a way to use strings to actually attach a letter grade to that persons file. For your input scores use a vector made by `scores = 100*rand(100,1)` assuming 100 students. **Write your function two ways: 1 using if statements and the other using the find command.** WARNING this slow way with if statements will be a tricky since you do not know in advance how long each vector of indices will be a priori