13.024 Problem Set 9:

Due: April 29, 2003

In this problem you will write matlab programs to calculate some parameters of a ship from an offset table. To have offset tables to work with, in the instructor's Athena Public directory are files called wigley5.out, wigley9.out and wig4125.out. An accompanying sheet shows the format of the offset files.

1. Write an matlab m-function for computing an integral (area under a curve) using the trapezoidal rule. Write another matlab m-function that computes an integral by Simpson's rule, presuming the input is an odd number of equally spaced points in the direction of integration.

2. The offset file "wigley5.out" is for a Wigley hull shape with a length of 50 meters, a beam of 10 meters and a draft of 5 meters. It has 21 sections 21 stations and 5 offsets, meaning 4 panels (on the half-hull). The file "wigley9.out" is the same except that there are 9 offsets on each half-station. Write an m-script to calculate the section areas and the vertical center of area of each station that calls one of your integration functions, putting the results in a file whose name is requested in the script. The number of stations and the number of points per station should be input parameters to the program. Do the following with each of the wigley5.out and wigley 9.out offset files.

   a. Do the calculation with the trapezoidal rule function.
   b. Do the calculation with the Simpson rule function.
   c. Compare the results with the two integration rules.

3. Write an m-script which reads a file you name, of the format generated in part 2 to calculate the total displacement and height of the center of area for the whole ship. Use this to compute these quantities for each of the files from part 2 and using both trapezoidal and Simpson's rule for the longitudinal integration.

4. The file "wig4125.out" is the same hull, but with 41 stations and 25 points per station. Do the above calculations with this file. If these results are taken as "accurate" how much error in total displacement and CG location results from using the fewer number of offsets in part 3 for both the 5 offset case and the 9 offset case.

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         9           4
-50.00000
0.0000000E+00  -5.000000
0.0000000E+00  -3.750000
0.0000000E+00  -2.500000
0.0000000E+00  -1.250000
0.0000000E+00  0.0000000E+00
-37.50000
0.0000000E+00  -5.000000
 1.588085      -3.750000
 2.609093      -2.500000
 3.215794      -1.250000
 3.417969      0.0000000E+00
-25.00000
0.0000000E+00  -5.000000
 2.851584      -3.750000
 3.909588      -2.500000
 4.493407      -1.250000
 4.687500      0.0000000E+00
-12.50000
0.0000000E+00  -5.000000
 4.134040      -3.750000
 4.697175      -2.500000
 4.910584      -1.250000
 4.980469      0.0000000E+00
0.0000000E+00
0.0000000E+00  -5.000000
 4.718432      -3.750000
 4.995117      -2.500000
 4.999995      -1.250000
 5.000000      0.0000000E+00
 12.50000
0.0000000E+00  -5.000000
 4.134040      -3.750000
 4.697175      -2.500000
 4.910584      -1.250000
 4.980469      0.0000000E+00
 25.00000
0.0000000E+00  -5.000000
 2.851584      -3.750000
 3.909588      -2.500000
 4.493407      -1.250000
 4.687500      0.0000000E+00
 37.50000
0.0000000E+00  -5.000000
 1.588085      -3.750000
 2.609093      -2.500000
 3.215794      -1.250000
 3.417969      0.0000000E+00
 50.00000
0.0000000E+00  -5.000000
0.0000000E+00  -3.750000
0.0000000E+00  -2.500000
0.0000000E+00  -1.250000
0.0000000E+00  0.0000000E+00
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Length 100 m
Beam 10 m
Draft 5 m
number of stations 9
Panels on each station 4