

## 12.010 Homework #4

Due Thursday, November 4, 2004

**Question (1): (25-points)** In C or C++ generate a table of natural and base 10 log values to 10 decimal places for arguments between 0.1 and 100 progressing by factors of  $10^{0.2}$  at each increment (i.e., arguments should go approximately as 0.100, 0.158, 0.251, 0.398 ...). Table should be no wider than 80 characters and should have headers explaining what the columns are.

**Question (2): (25-points).**

Write a C or C++ program that reads your name in the form <first name> <middle name> <last name> (using the `InputString` function) and outputs the last name first and adds a comma after the name, the first name, and initial of your middle name with a period after the middle initial. If the names start with lower case letters, then these should be capitalized. The program should not be specific to the lengths of your name (ie., the program should work with anyone's name).

As an example. An input of  
thomas abram herring  
would generate:  
Herring, Thomas A.

**Question (3): (50-points)** Write a C or C++ program that will compute the initial velocity and launch angle of a ballistic body traveling under the influence of gravity that depends on height above a flat surface (use formula from HW 1, Question 6 solution) and air drag (according to formula in Question 6 solution) so that it will hit a target a given distance down range (see figure below). You do not include the effects of turbulence or faster than sound velocities.

Compare your results with Homework #2 and #3 results by computing the initial velocity and launch angle needed for a body weighing 500 kg with cross sectional area of  $0.01 \text{ m}^2$  and drag coefficient of 0.1 to hit a target 100 km away within 100 m. You can assume that the density of air  $1.29 \text{ kg/m}^3$ . If you want to make your program more realistic, you could assume air density decreases with altitude (density decreases exponentially with a scale height of 7.5 km).