Math 530, Spring 2009

Homework 4 Due March 30

1. Use dimensional analysis to develop a model for the drag force on a sphere as it passes through fluid.

a) Assume that the sphere has a low speed, and the fluid density can be neglected. Express drag froce F as a function of the radius r , velocity v and viscosity μ of the fluid.

b) Add the fluid density ρ to the list of variables and repeat the analysis above.

2. Consider a zero-depth explosive burst. Develop a model for the crater volume V as a function of explosive mass W, specific energy Q_e, explosive density δ, soil density ρ, as well as soil strength Y (considered as resistance to pressure with dimensions $ML^{-1}T^{-2}$) and gravity acceleration g.