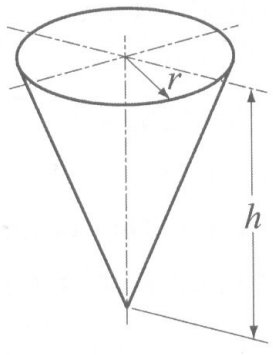
CHEN.3170 Applied Problem Solving with Matlab

A Short Quiz on

Function Evaluation and Plotting in Matlab (using function subprograms)

The volume, V, and surface area, A, of a cone-shaped paper cup are given as

$$V = \frac{1}{3}\pi r^2 h \qquad \text{and} \qquad A = \pi r\sqrt{r^2 + h^2}$$



where r is the radius of the base and h is the height of the cup (see sketch).

Note: The questions below ask you to write a series of Matlab routines to evaluate and plot these functions. Of course, this can be done in a number of ways, but the tasks here take you down a specific path to evaluate your understanding of several features within Matlab -- so **please follow the steps/instructions given here carefully**.

a. Write a function routine to compute the volume, V, and area, A, given the values of r and h as inputs. The function should allow a **vector input** for the radius of the base, r, but only **scalar values** of height are treated. The outputs, V and A, should be the same size as r.

b. Write a Matlab script file that uses your function file from Part a to evaluate and plot both V(r) and A(r) for four different values of h (for h = 4, 6, 8, and 10 cm). Note that the volume and area are functions of two variables and they should be stored as 2-D arrays in your Matlab program. The program should plot the computed results in a quantitative fashion, where r varies from 5 to 20 cm. Visualize the V(r,h) and A(r,h) behavior in two separate well-labeled figures (no subplots here please), where each plot will have multiple curves to account for the different h values (you do not need to worry about different line styles). Use the back side of the page as needed…