Worksheet #6
Math 221

**Instructions.** Put the first and last name of everyone in your workgroup at the top of your paper. Everyone is to do their own worksheet but only one from each group is graded with the score shared. Be sure to show your work and explain your reasoning.

1. A vase is made from an inverted right circular cone of height 20 inches and radius 5 inches. In general, the volume of a right cone of height $h$ and radius $r$ is $\frac{1}{3} \pi r^2 h$.

   (a) Find a formula for $V(h)$, the volume of liquid in the vase if it is $h$ inches deep.
   
   (b) Plot $V(h)$ and $\frac{dV}{dh}$.
   
   (c) If the vase is being filled at a constant rate, plot $V(t)$ and $\frac{dV}{dt}$ as well as $h(t)$ and $\frac{dh}{dt}$.

2. Now consider the vase pictured (also of height 20 inches and obtained by rotating a curve):

   (a) Sketch the plots of $V(h)$ and $\frac{dV}{dh}$.
   
   (b) If the vase is being filled at a constant rate, plot $V(t)$ and $\frac{dV}{dt}$ as well as $h(t)$ and $\frac{dh}{dt}$.