Math 2167: Homework 2
Due: Friday, September 6th

Water is running into the vase below at a constant rate. Let $V(t)$ represent the volume of water in the vase, $h(t)$ the height of the water in the vase, and $r(t)$ the radius of the surface of the water.

1) At the point in time, t, shown in the picture, determine for each of the quantities that follow whether it is positive, negative, or zero, and explain your reasoning.

(a) $V(t)$

(b) $V'(t)$

(c) $h(t)$

(d) $h'(t)$

(e) $r(t)$

(f) $r'(t)$

2) For each of the following, sketch the graph, and give a description of what is happening.

(a) $V(t)$ over the period in which the vase was filled, starting from empty.

(b) $V'(t)$ over the period in which the vase was filled, starting from empty.

(c) $h(t)$ over the period in which the vase was filled, starting from empty.

(d) $h'(t)$ over the period in which the vase was filled, starting from empty.

(e) $r(t)$ over the period in which the vase was filled, starting from empty. (assume the bottom of the vase was wet at the start (i.e., $r(0) > 0$)).

(f) $r'(t)$ over the period in which the vase was filled, starting from empty.