

1. [10 points] There is a bucket, shaped like a cylinder, with a radius of 5 inches and a height of 20 inches. It has a circular hole in the bottom which has a radius of 1 inch. The bucket begins full of water, but it flows out the hole in the bottom. Let t be the number of seconds since the water began dripping from the bucket, and let $V(t)$ denote the volume (in inches³) of water remaining in the bucket at time t . Let $h(t)$ be the depth of the water in the bucket at time t .
- a. [2 points] Write a formula for the volume of water in the bucket, $V(t)$, as a function of the depth of the water in the bucket, $h(t)$.

- b. [8 points] The volume of water changes such that it satisfies the differential equation

$$\frac{dV}{dt} = -0.6\pi\sqrt{19.6h}.$$

Solve for the depth of the water at time $t = 10$. Be sure to include units in your answer.