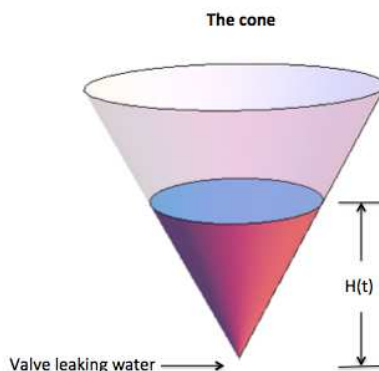


7. [15 points] A cone is filled with water up to a depth of H_0 m. At time $t = 0$, a valve at the bottom of the cone is opened. Water leaks out of the cone through the opened valve. Let $H(t)$ be the depth of the water (in m) in the cone at time t (in hours). The function $H(t)$ satisfies the differential equation

$$\frac{dH}{dt} = \frac{k}{H^{\frac{3}{2}}}$$

- a. [2 points] What must be the sign and units of k ?



- b. [7 points] Find a formula for $H(t)$. Your formula should include k and H_0

This problem continues on the next page.

Problem 7 continued

- c. [4 points] If the cone is filled with water up to a depth of 4 m at $t = 0$. What should the value of k be in order for the cone to be empty after an hour? Show all your work.

- d. [2 points] Does the differential equation satisfied by H have equilibrium solutions? If it does, find them.