Problem 1. A tank shaped like a vertical cylinder initially contains water to a depth of 9 ft. A plug on the bottom of the tank is pulled at time $t = 0$ (t in hours). After 1 h the depth has dropped to 4 ft. How long will it take all the water to drain from the tank?

Problem 2. The shape of a water tank is obtained by revolving the curve $y = x^{4/3}$ around the y-axis (units on the coordinate axes are in feet). A plug at the bottom of the tank is removed at 12 noon, when the water depth is 12 ft. At 1 P.M. the water depth is 6 ft. Find the size of the plug and determine at what time the tank will be empty.

Problem 3. A 12 hour water clock is to be designed with the shape of the surface obtained by revolving a certain curve $y = f(x)$ around the y-axis, subject to the following constraints: its height must be 4 ft, its diameter be 2 ft at that height, and a circular hole must be cut in the bottom so that the water level in the tank falls at the *constant* rate of 4 in./h. Determine the equation the curve must have and also what the radius of the hole in the bottom needs to be.