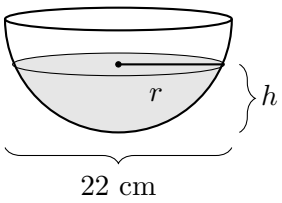
12. [9 points]

A hemispherical bowl of radius 11 centimeters is being filled with water at the constant rate of π cubic centimeters per second, as pictured to the right. When the depth of the water from the bottom of the bowl is h centimeters, the volume of the water in the bowl in cubic centimeters is given by



$$V = 11\pi h^2 - \frac{\pi}{3}h^3.$$

a. [4 points] At what rate is the depth of water in the bowl increasing when the depth of the water is 2 centimeters, in units of centimeters per second?

Answer: _____ cm/sec

b. [5 points] As the bowl fills up, the circular surface of the water grows larger. At what rate is the area of the water's surface increasing when the depth of the water is 2 centimeters (as in part **a**)? *Include units.*

Answer: _____