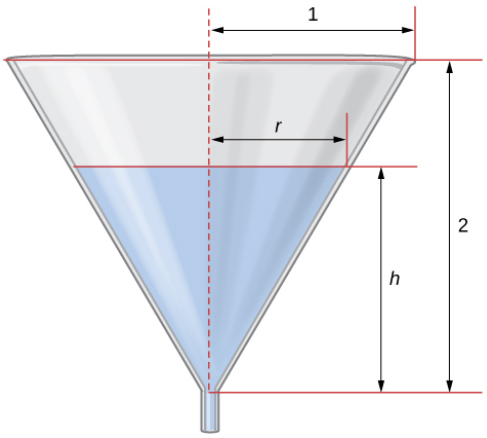
Name: _____ _____ **/ 25**

Please circle your instructor's name: Leah Berman Jill Faudree James Gossell

There are 25 points possible on this quiz. Any outside materials (textbook, course notes, calculator) are not allowed. **For full credit, show all work in a way someone else can follow it.**

1. (10 points) Water is draining from the bottom of a cone-shaped funnel at a rate of 0.1 cubic feet per second. The height of the funnel is 2 feet and the radius at the top of the funnel is 1 foot.



Note that the formula for the volume of water in the cone is given by $V = \frac{1}{3}\pi r^2 h$.

Note that you can use similar triangles to find a relationship between r and h.

a) **Find the rate at which the height of the water in the funnel is changing** when the height of the water (h) is 1 foot.

b) Using complete sentaces, **explain what your answer in part (a) means** in the context of this problem. Include units in your explaination.

2. (7 points) Complete the following steps to approximate $\sqrt[3]{30}$ without a calculator:

   (a) Find the linear approximation $L(x)$ to $f(x) = \sqrt[3]{x}$ at $a = 27$.

   (b) Use $L(x)$ to approximate $\sqrt[3]{30}$. Write your answer as a fraction.

3. (8 points) Find the absolute maxima and minima for the function $f(x) = x(x-4)^3$ over the interval $[0,5]$. Show your work, including relevant computations.

maximum value of $f(x)$: _____

minimum value of $f(x)$: _____