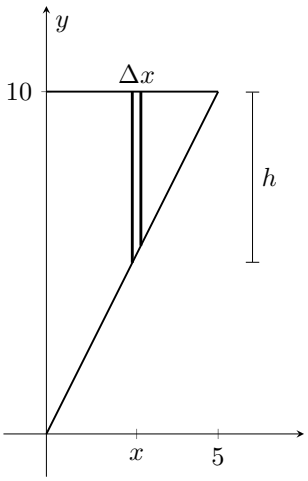
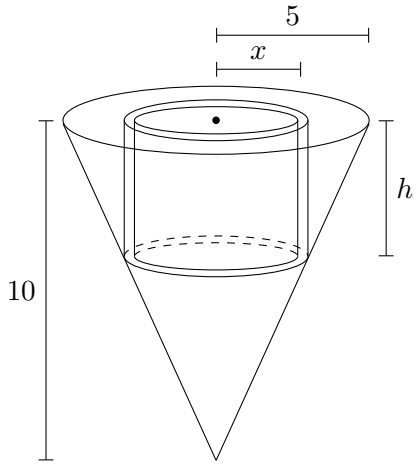
9. [12 points] Eren is an ice cream vendor who loves to experiment with new ideas. He decides to create an ice cream treat by rotating the region bounded by the y-axis, $y = 2x$, and $y = 10$ about the y-axis, as shown in the figure below, where all distances are measured in centimeters. The density of the ice cream at a point x centimeters from the y-axis is given by $\delta(x) = \sqrt{x^2 + 1}$ grams per cubic centimeter (g/cm^3).





a. [2 points] Consider the thin vertical strip of the region depicted above on the left, which is located x centimeters from the y-axis, and has height h and small thickness Δx. Find a formula for h in terms of x.

Answer: $h =$ _____

b. [4 points] When the strip above is rotated around the y-axis, it forms a thin **cylindrical shell** (depicted above on the right). Write an expression which approximates the **volume** of that shell. Your answer should not involve the letter h. **Include units.**

Answer: _____ **Units:** _____

c. [3 points] Write an expression that approximates the **mass** of the thin cylindrical shell of ice cream described in part **b.** Your answer should not involve the letters h or δ. **Include units.**

Answer: _____ **Units:** _____

d. [3 points] Write an expression involving one or more integrals that represents the **total mass** of the ice cream in the treat. **Do not** evaluate any integrals in your expression. Your answer should not involve the letters h or δ. **Include units.**

Answer: _____ **Units:** _____