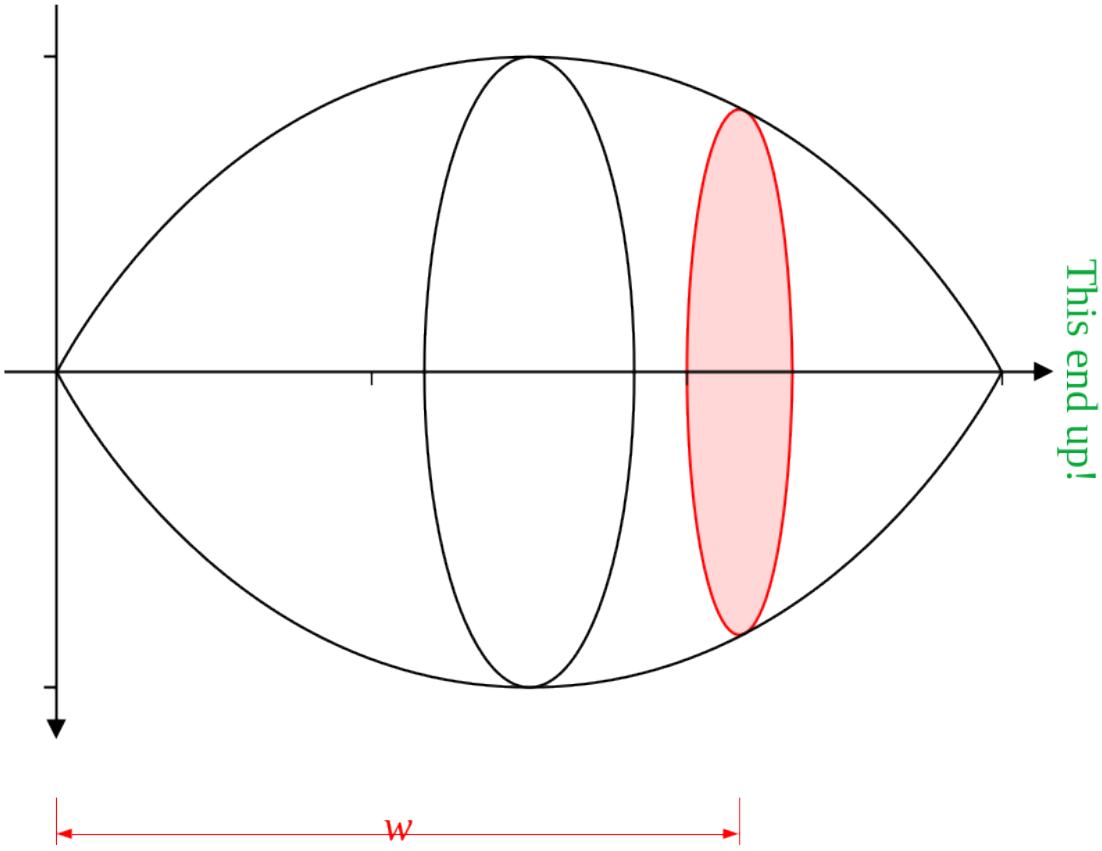
Mathematics 1120H – Calculus II: Integrals and Series
TRENT UNIVERSITY, Winter 2024

Assignment #2
Volumes and Rates
Due just before midnight on Friday, 26 January.*

A tank has the shape of the solid of revolution obtained by revolving the curve $x = \sin\left(\frac{\pi y}{3}\right)$, for $0 \le x \le 3$, about the y-axis, with both axes being measured in metres.



The tank is completely filled with water which is then drained from the tank at a contant rate of 100 litres per minute. Suppose that a given instant the water in the tank is w metres deep.

1. What is the volume (in litres) of the water in the tank at the given instant? Work it out both by hand and by using SageMath. *[6]*

NOTE. If you don't remember or didn't see how to compute the volume of a solid of revolution, please check out §9.3 in the textbook, or the lectures on this topic from past iterations of MATH 1110H and 1120H on the archive page at: `http://euclid.trentu.ca/math/sb/calculus/`

2. How is the depth of the water in the tank changing at the instant that the depth is 2 metres? Work it out *without* implicitly or explicitly using your final answer to question **1**. You may use SageMath, or do it by hand, or mix these up. *[4]*

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* You should submit your solutions via Blackboard's Assignments module, preferably as a single pdf. If submission via Blackboard fails, please submit your work to your instructor by email or on paper.