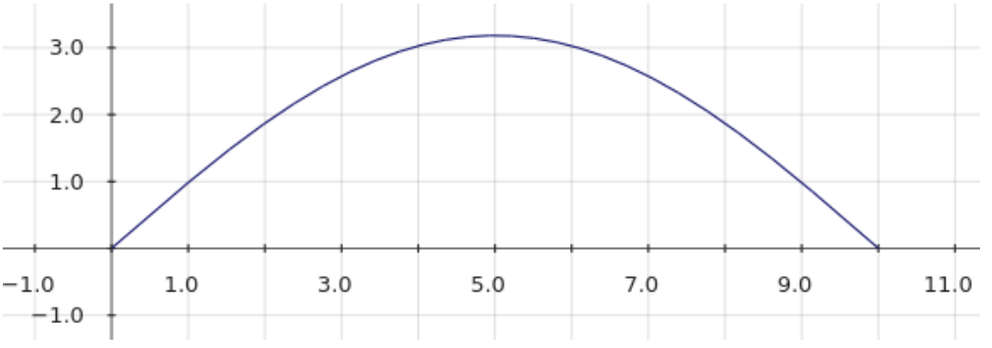
Mathematics 1110H – Calculus I: Limits, derivatives, and Integrals
TRENT UNIVERSITY, Winter 2021

Assignment #4
Arch and Door
Due on Friday, 12 March.

Submission: Scanned or photographed solutions are fine, so long as they are legible. Please try to make sure that they are oriented correctly – if they are sideways or upside down, they're rather harder to mark! Submission as a single pdf is strongly preferred, but other common formats are probably OK in a pinch. Also, please do not submit a file in one of `Maple`'s (or comparable program's) native format, though a printout of one to pdf would be more than acceptable. Please submit your solutions via Blackboard's Assignments module. If Blackboard does not acknowledge a successful upload, please try again. As a *last* resort, email your solutions to the instructor at: `sbilaniuk@trentu.ca`

Architect Rhom builds an arched passage with a flat floor between two buildings, with a cross-section of the arch looking like the graph of $y = \frac{10}{\pi} \sin\left(\frac{\pi x}{10}\right)$ for $0 \leq x \leq 10$.



At the end of the passage Rhom puts a rectangular door whose bottom edge brushes the floor of the passage when it is opened.

1. If Rhom makes the area of the door as large as possible while still fitting inside the arch, what are the height and width of the door? *[10]*