

## Mathematics 1110H – Calculus I: Limits, Derivatives, and Integrals

TRENT UNIVERSITY, Fall 2025

### Assignment #1 – Plotting With SageMath<sup>†</sup>

Due on Friday, 19 September.\*

Please take a peek at what is in the *SageMath* folder in the *Course Content* section of the course Blackboard site. If you didn't go to the lab, or have forgotten what went down, at least read the handout *Getting Started with sage.trentu.ca* that is attached to the link to Trent's SageMath server, and skim through Sections 1.4 and 3.4 of Gregory Bard's *Sage for Undergraduates*.

1. Use SageMath to plot each of the functions in **a–h** for the indicated values of  $x$ . [ $4 = 8 \times 0.5$  each]
  - a.  $a(x) = \sqrt{x}$  for  $0 \leq x \leq 4$ .
  - b.  $b(x) = \sqrt{4 - x^2}$  for  $-2 \leq x \leq 2$ .
  - c.  $c(x) = 2 \sin(x) \cos(x)$  for  $-2\pi \leq x \leq 2\pi$ .
  - d.  $d(x) = \sqrt{|x|}$  for  $-4 \leq x \leq 4$ .
  - e.  $h(x) = \ln(x)$  for  $0 \leq x \leq 2$ .
  - f.  $f(x) = -\frac{3}{5} \sqrt{25 - x^2}$  for  $-5 \leq x \leq 5$ .
  - g.  $g(x) = \cos\left(2\left(x - \frac{\pi}{4}\right)\right)$  for  $-2\pi \leq x \leq 2\pi$ .
  - h.  $e(x) = x^2$  for  $-2 \leq x \leq 2$ .
2. Use SageMath to plot each of the curves in **a–f** for the indicated values of  $x$  and/or  $y$ . [ $3 = 6 \times 0.5$  each]
  - a.  $x^2 + y^2 = 4$  for all  $x$  and  $y$  satisfying the equation.
  - b.  $x = y^2$  for  $0 \leq x \leq 4$  and corresponding  $y$  satisfying the equation.
  - c.  $x = e^y$  for  $-\ln(2) \leq y \leq \ln(2)$  and corresponding  $x$  satisfying the equation.
  - d.  $\frac{x^2}{5^2} + \frac{y^2}{3^2} = 1$  for all  $x$  and  $y$  satisfying the equation.
  - e.  $|y| = \sqrt{x}$  for  $0 \leq x \leq 4$  and corresponding  $y$  satisfying the equation.
  - f.  $x = \arcsin\left(\frac{y}{2}\right)$  for all  $x$  and  $y$  satisfying the equation.
3. If we consider curves as sets of points in the Cartesian plane, some of the curves plotted in questions **1** and **2** are part of, or the same curve, as other curves plotted in these questions. Find as many such cases as you can. [ $3$ ]

NOTE. Correct pairs will add to your mark and incorrect pairs will subtract from it. Such addition and subtraction will be capped so that you can't get less than 0 or more than 3 on this question.

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<sup>†</sup> ... even as it plots against you. :-)

\* 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 as soon as you can. You may work together, look things up, and use whatever tools you like, so long as you write up your submission by yourself and give due credit to your collaborators and any sources and tools you actually used.