Mathematics 1110H – Calculus I: Limits, Derivatives, and Integrals
Trent University, Fall 2018
Assignment #3
More Maple
Due on Friday, 5 October.

If you haven't already done so for Assignment #1, you should at least skim through the handout *A very quick start with Maple* and *Getting started with Maple 10*, by Gilberto E. Urroz. For this assignment, you might also profit from checking out *A survey of mathematical applications using Maple 10*, also by Prof. Urroz. As always, you should exploit Maple's own help and tutorials, and this course's Maple labs, as necessary. Remember also that you may use other software with similar capabilities instead of Maple, such as Mathematica or SageMath, but it will be your responsibility to learn how to use them to do this assignment if you choose to do so.

1. Use Maple to graph $y = \dfrac{\ln(x)}{x}$ for $0 < x < 10$ and $-10 < y < 2$. Based on this graph, what would you expect $\displaystyle\lim_{x\to\infty} \dfrac{\ln(x)}{x}$ to be? *[1]*

2. Use Maple actually evaluate $\displaystyle\lim_{x\to\infty} \dfrac{\ln(x)}{x}$. *[1]*

3. Use Maple to graph the curve defined by $\left(x^2 + y^2 + 2y\right)^2 = 4\left(x^2 + y^2\right)$. *[2]*

4. Use Maple to find all the points where $y = x$ intersects $\left(x^2 + y^2 + 2y\right)^2 = 4\left(x^2 + y^2\right)$. Use it to find the coordinates of these points both exactly* and as decimals with at least 10 digits of accuracy. *[4]*

5. Find the (exact!) coordinates of all the points (x, y) where the line $y = x$ intersects the curve $\left(x^2 + y^2 + 2y\right)^2 = 4\left(x^2 + y^2\right)$ yourself. Show all your work! *[2]*

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* For example, $x = \dfrac{-1 + \sqrt{5}}{2}$ and $x = \dfrac{-1 - \sqrt{5}}{2}$ are the exact solutions of $x^2 + x - 1 = 0$.