Mathematics 1101Y – Calculus I: Functions and calculus of one variable
TRENT UNIVERSITY, 2013–2014

Assignment #2
Solving equations with and without `Maple`
Due on Monday, 4 November, 2013.

Before attempting the questions below, take another peek at Section 1.6 of the text for the definitions of the various hyperbolic functions. It might also be useful to skim through *Getting started with* `Maple 10` by Gilberto E. Urroz – read those parts concerned with solving equations more closely. You can find a link to it on the MATH 1101Y web page. `Maple`'s help facility may also come in handy, especially when trying to make out the intricacies of what the `solve` command *[Hint! Hint!]* and its options and variations do. Make use of the `Maple` labs, too!

We won't see much of the hyperbolic trig functions in this course, but they do provide various examples of things that are just too juicy to pass up entirely, such as our example in class of finding the inverse function of $\cosh(x)$. In this assignment we will do the same for $\operatorname{sech}(x) = \dfrac{1}{\cosh(x)} = \dfrac{2}{e^x + e^{-x}}$, among other things.

1. Explain why every point on the parametric curve $x = \operatorname{sech}(t)$ and $y = \tanh(t)$, $-\infty < t < \infty$, is on the circle $x^2 + y^2 = 1$. Do you get every point on the circle this way? Explain why or why not. *[2]*

2. What are the domain and range of $\operatorname{sech}(x)$? Use `Maple` to plot the curve $y = \operatorname{sech}(x)$. [Please submit a printout of your worksheet.] On the basis of your plot, how much of $\operatorname{sech}(x)$ should be invertible? *[1]*

3. Find an expression – by hand! – for $\operatorname{arcsech}(x)$, the inverse function of $\operatorname{sech}(x)$, in terms of the natural logarithm function. *[2]*

4. Use `Maple` to find an expression for $\operatorname{arcsech}(x)$ in terms of the natural logarithm function. [Please submit a printout of your worksheet.] Is this the same as the one you obtained by hand? *[2]*

5. What are the domain and range of $\operatorname{arcsech}(x)$? [Your version of the expression, if it's different from `Maple`'s.] *[2]*

6. Just for fun – and a mark too! – use `Maple` to find any and all the real roots of the cubic equation, $x^3 - 2x^2 + 3x - 4 = 0$, to 10 decimal places. *[1]*

REFERENCES

1. *Calculus: Early Transcendentals* (2nd Edition), by Jon Rogawski, W.H. Freeman, New York, 2012, ISBN-10: 1-4292-6009-2, ISBN-13: 978-1-4292-6009-1.
2. *Getting started with Maple 10*, by Gilberto E. Urroz (2005), which can found (pdf) at: `http://euclid.trentu.ca/math/sb/1101Y/2012-2013/GettingStartedMaple10.pdf`