**Mathematica  Lab I**



*(Lab report due: Wednesday, September 9th)*

You have the option of downloading Mathematica 9 (or 10) on your laptop (for free) or else using Loyola’s network.

First read the following sections of Thomas’ [An Introduction to Mathematica](http://media.pearsoncmg.com/cmg/pmmg_mml_shared/calculus/mathematica/manual/MM01.pdf).

* Mathematica arithmetic
* Assigning names
* Mathematica commands
* Common problems and how to fix them

You are encouraged to view several of the *Mathematica* tutorials <http://www.wolfram.com/broadcast/screencasts/handsonstart/>

Also helpful is the [Online Mathematica Manual for Thomas’ Calculus](http://wps.aw.com/aw_thomas_calculus_series/)

Submit a *printed version* of your Mathematica notebook. You may (*and are encouraged to*) work with other students and compare results, but ultimately you must submit *your own* lab results --- *not* a shared copy. On your front page (using *Mathematica*) state your name and “Mathematica Lab I” using an appropriate style, font, size and color. *Number* each problem and *restate the problem* before giving the solution. Use *Mathematica* input, *not* free-form input!

1. Which is larger?: e or e  Explain why?

1. Express 1.234.567 correct to 11 significant digits.

3. Using the **FactorInteger** command, find the prime decomposition of 1234567890

4. Using the **Simplify** command, simplify the expression

 

5. Find the largest prime factor of n = 889 + 744 + 1

6. A [*Mersenne*](https://en.wikipedia.org/wiki/Marin_Mersenne) *prime* is defined to be a prime number of the form 2n – 1. Using basic algebra, it is easy to show that if 2n – 1 is prime then *n* must be prime as well. In 1644, in the preface to his book, *Cogitata Physica-Mathematica*, Mersenne asserted that 2n – 1 is prime for n = 2, 3, 5, 7, 13, 17, 19, 31, 67, 127. Was Mersenne correct? Explain.



[the 46th Mersenne prime found in 2008](http://content.time.com/time/specials/packages/article/0%2C28804%2C1852747_1854195_1854157%2C00.html)

7. Which is larger: 55! or 2255 ? Why?

8. Using the **Expand** command, simplify fully the expression

(a + b – c)3 – (a – b – c)3

9. Simplify $\left(1+\sqrt{7}\right)^{8}-\left(1-\sqrt{7}\right)^{8}$

10. Simplify the algebraic expression $\frac{1}{x - \frac{1}{x + \frac{1}{x}}}-\frac{1}{x + \frac{1}{x - \frac{1}{x}}}$

11. Solve the quartic equation x4 – 8x3 + 10x2 + 24x + 5 = 0 using

(a) the Solve command

(b) the NSolve command

How do these two results differ?

 *“If you don't know where you are going, any road will get you there.”*

                                       - Lewis Carroll
 

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