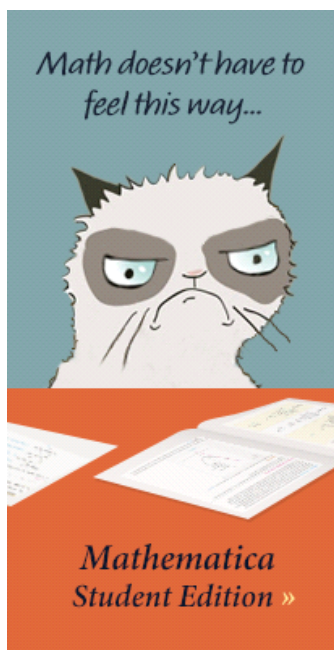


MATHEMATICA LAB I



(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](#).

- 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](#)

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^π or π^e Explain why?
2. Express $1.23^{4.567}$ correct to 11 significant digits.
3. Using the **FactorInteger** command, find the prime decomposition of
1234567890
4. Using the **Simplify** command, simplify the expression

$$\frac{1}{(a-b)(a-c)} + \frac{1}{(b-c)(b-a)} + \frac{1}{(c-a)(c-b)}$$

5. Find the largest prime factor of $n = 88^9 + 74^4 + 1$
6. A Mersenne prime is defined to be a prime number of the form $2^n - 1$. Using basic algebra, it is easy to show that if $2^n - 1$ is prime then n must be prime as well. In 1644, in the preface to his book, *Cogitata Physica-Mathematica*, Mersenne asserted that $2^n - 1$ 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](#)

7. Which is larger: $55!$ or 22^{55} ? Why?
8. Using the **Expand** command, simplify fully the expression

$$(a + b - c)^3 - (a - b - c)^3$$

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

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 $x^4 - 8x^3 + 10x^2 + 24x + 5 = 0$ 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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