Overview:

In this lab you will practice mathematical writing for a non-technical audience. You will need to solve a problem, posed in a fictional letter, and explain your solution in the form of response letter. You will probably want to include equations, and perhaps data or graphs as well. In this lab we will learn guidelines on mathematical writing, and we will practice using the typesetting capabilities of Mathematica.

Keep in mind what you learned about good mathematical writing in Guide to Writing Mathematics, use the checklist from that document to evaluate your first draft, and revise your draft as needed before submitting your letter. In particular, make sure to pay attention to what she says about *non-technical* writing. I will be looking to make sure that you

1. Restate the problem that was asked,

2. Give a brief description of your solution (before explaining how you solved the problem),

3. Show *that* your solution works (still before explaining how you solved the problem),

4. Explain how you solved the problem, stating any assumptions you are making, defining any variables you use (and don't include more variables than you actually need!), including clearly labeled tables or graphs if they will help you make your point, and explaining how each formula is derived (or indicating a reference where a person could find a derivation of the formula),

5. Use correct spelling, grammar, and punctuation, so that your point comes across as clearly as possible.

Lab Assignment:

1. Read the attached letter asking you for your help in solving a mathematical problem.

2. Solve the problem.

3. Write up a report (a response letter) with your solution. Follow the Guide to Writing Mathematics. Review your report in terms of the Checklist.

4. When you have finished this report, save it as a pdf file in your M-drive Classes folder. When you save the file, use the name `Lab9_yourname.pdf`. Make sure your final draft is there by 5pm November 3.

5. Print a hard copy and bring it to lab with you November 3.

This letter is adapted from one of Annalisa Crannell's writing assignments.

The General Spore
12 Monera Way
Plum, PU 43210
October 27, 2011

October 26, 2011

Goshen College
1700 S. Main St.
Goshen, IN 46535

Dear Calculus Student,

I'm a biochemical engineer, and I've been working on developing a heterotrophic bacteria which converts waste matter into energy. This is a fun field of work: converting trash into energy is a popular idea nowadays, since we seem to have too much of the former and limited supplies of the latter. Usually the conversion is done by burning, but I've been working on a cleaner, less toxic method.

These bacteria that I've been working on die in exposure to sunlight, especially ultra-violet, which means that they're unlikely to be an environmental contaminant. But if you put them in the dark with a big, well-mixed tub of wet household trash, they reproduce (albeit fairly slowly), doubling their numbers every two months. (Some bacteria, such as E. coli, double their numbers every 20 or 30 minutes). And–this is the great part–every time they reproduce, they give off energy in the form of heat, which we can harness and convert into electricity. They generate energy in direct proportion to their growth rate; so the faster they reproduce, the more electricity we can make.

Right now I'm in the midst of working on a proposal for operating an experimental energy site on the banks of Plum Lake. Our biggest competitor is the King Coal Company, which certainly isn't known for its environmental concern. Even if I weren't applying for the site myself, I wouldn't want a coal company operating next to our lake. However, my personal interests make me doubly anxious to get this contract. The folks at The General Spore are very supportive and are encouraging me to give this proposal a lot of my time and (pardon the expression) energy.

The one thing I'm anxious about is making sure that I'll actually have sufficient bacteria to have the plant running at capacity within a year of start-up. I have exactly 125 pounds of bacteria now, in the freezer; by the end of twelve months, I'll need to have the bacteria multiplying at a rate of 2.7 tons/month or 180 lbs/day. The trouble is, I don't know how to figure out how fast they'll be multiplying by the one-year point. I know that in two months I'll have 250 pounds, and by six months I'll have one ton of bacteria, but I have no idea how to

get a general formula for the number of bacteria on, say, the odd months–much less on days within the month.

Now, I know that this kind of stuff is probably really trivial to you, seeing as you're in Calculus, but it confounds me. Do you think you could help me out with this? I just need a general formula for the amount of bacteria (by weight) on any given month; and I need a prediction as to whether they'll be reproducing fast enough on the last day of the year.

Thanks so much for your help; I hope I'll hear from you one way or another by November 3.

<div align="center">

Sincerely,

Grace Amazing

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P.S. We are still searching for a suitable name for this bacteria. If you can think of a good name, please do suggest it to us!