History of Mathematics
Homework 5

Ethan Bolker

March 8, 2014

The first question requires work before Tuesday. It's all due on Thursday, March 13 .

1. Come prepared to discuss possible term paper topics.

   Your paper should follow the model we've used in the course: present some mathematics in the form appropriate to the period or author you're discussing, along with a modern version and connections to your own education. Think small – one theorem, one novelty, in context,

   I'd like it best if you chose a topic that you know you want to know more about, but I am willing to make some suggestions. Here are a few.

   - Biography. There are good ones on Srinivasa Ramanujan, David Hilbert, Richard Courant, Julia Robinson, Leonhard Euler, Paul Erdős, ...

     More at `http://www.ericweisstein.com/encyclopedias/books/MathematicsBiography.html`

     Note: You have to read a whole book, then choose and and write about some actual mathematics in the way I suggest above. You can't just cut some stuff from web pages.
   - Follow up on some topic we've touched on in class that you would like to know more about. The text suggests lots of references.
   - Write about some mathematical contribution from a nonwestern culture – China, India, Babylon, Africa, ...
   - Write about the history of some mathematics that connects to its use in other sciences – perhaps calculus and Newtonian mechanics, matrix algebra and quantum mechanics or Riemannian geometry and relativity theory.
   - Check out papers from previous essay competitions at `http://historyofmathematics.org/` – the web site for the MAA's special interest group on the History of Mathematics. Any paper you write that's good enough to submit for the 2014 contest will earn you an automatic A in this

course. (The 2013 contest closes March 19, so it's too late for that one.)

2. Do Exercise 4.38 in the text.

3. What is the etymology of the word "cyclotomic"?

4. The Euclidean Algorithm (which we will study in class Tuesday).

   (a) Find a solution in integers to the equation

   $$1001x + 512y = 1.$$

   (b) Where in Euclid will you find the Euclidean algorithm? Did Euclid invent/discover it?

   (c) Show that after every two steps in the Euclidean algorithm, the remainder is reduced by at least one half. Conclude that the Euclidean algorithm terminates in at most $2\log_2(b)$ steps. In particular, show that the number of steps is at most seven times the number of digits in b.

   (d) Experiment with the Euclidean algorithm applied to find the greatest common divisor of consecutive Fibonacci numbers. Discover something cool.

Here is the LaTeX source for this document. You can cut it from the pdf and use it to start your answers. I used the `\jobname` macro for the source file name, so you can call your file by any name you like.

```
% Math 370 hw5 Spring 2014
%
\documentclass{article}
\pagestyle{empty}

\usepackage{amsmath}
\usepackage{amsthm}
\usepackage{hyperref}
\usepackage{graphicx}
\usepackage{verbatim}

%% create an environment for theorems
\newtheorem*{thm}{Theorem}

\newcommand{\coursehome}
{http://www.cs.umb.edu/~eb/370}

\title{History of Mathematics \\
Homework 5
}
\author{Ethan Bolker}

\begin{document}

\maketitle

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\newpage

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\verbatiminput{\jobname}

\end{document}
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