MAT3166: ASSIGNMENT #1

DUE IN CLASS ON FRIDAY, SEPTEMBER 23, 2011

Part I: Exercises in Number Theory

Exercise numbers refer to the textbook, for your information. Answers are not difficult to find, of course, but you will gain more from the experience if you try to work them out on your own, using ideas discussed in class. (If you do consult an outside source, please cite it, and you must close that book/website and write up your solution by yourself, with your own explanations.)

1. Prove, using the division algorithm, that the product of any three consecutive integers is divisible by 3.

2. Compute the gcd of 1071 and 408 with the Euclidean algorithm; call it $g$. Use the extended Euclidean algorithm to solve $g = 1071x + 408y$. Verify your gcd by giving the prime factorization of each of 1071 and 408.

3. Exercise 2.3 #5: Find all primes $p$ such that $11p + 1$ is a perfect square.

4. Exercise 2.5 #7: Show that $6k + 5$ and $7k + 6$ are relatively prime, for any integer $k \geq 1$.

5. Let $a, b \geq 1$. Define the least common multiple $m = \lcm(a, b)$ of $a$ and $b$ to be the least positive integer $m$ such that $a|m$ and $b|m$. Prove that (a) if $n$ is a common multiple of $a$ and $b$ then $m|n$; (b) $m = ab/(a, b)$.

6. Exercise 2.6 #13, a classical problem posed by Bachet, who wrote recreational mathematics books, among them “Problèmes plaisans et delectables qui se font par les nombres” (1612). Here’s the problem (direct quote from Kumanduri-Romero, page 54):

A party of 41 persons, men, women and children, take part in a meal at the inn. The bill is 40 sous and each man pays 4 sous, each woman 3, and each child $\frac{1}{3}$ sous. How many men, women and children were there?

Part II: Preparation for the Project

a) Please see the section entitled “Some information about getting started with LaTeX” on the page http://padic.mathstat.uottawa.ca/~mnevins/thesis/

This link is also available from our course webpage.

b) Install \LaTeX{} on your computer; there are several choices for various platforms listed on “The \LaTeX{} project” although MikTex is probably the most common choice for the Windows operating system.

c) Open the sample document (latexsample.tex or latexprimer_fr.tex) in a text editor and edit the section:

\begin{verbatim}
\title{Your short title}
\author{You}
\email{Your email address}
\end{verbatim}

with your own information.

d) (This is the part to submit.) Compile the resulting file (using pdflatex if possible, but dvi is ok too) and email the output to me (mnevins@uottawa.ca).