Midterm assignment

MATH 354, spring 2016

Due for Tuesday, March 8

Your task is to write a program that accepts:

- a tuple of nonzero integer moduli $m_1, \ldots, m_n$;
- a tuple of integer parameters $a_1, \ldots, a_n$;
- a tuple of integer parameters $b_1, \ldots, b_n$,

and returns a description of the complete set of integer solutions x of the system

$$\begin{cases} a_1 x \equiv b_1 \pmod{m_1} \\ a_2 x \equiv b_2 \pmod{m_2} \\ \quad \vdots \\ a_n x \equiv b_n \pmod{m_n}. \end{cases}$$

The set of solutions should be described in a canonical way. In other terms, if two different inputs produce sets of solutions that are identical, the outputs generated by the program should also look exactly the same.

You may use whatever programming language you prefer. However, any numerical functions other than the four basic arithmetic operations (addition, subtraction, multiplication, division with remainder) must be implemented by yourself. (So if the programming language has e.g. a built-in routine `gcd(x,y)`, you are not allowed to use it.)

I will do a test run of your program, but also read your code. Please make sure it is understandable; include comments if necessary.

Evaluation will be based on:

- For any input that respects the specifications, the ability of the program to return the correct result.
- For any input that does not, its ability to halt cleanly and explain why the input was wrong.
- Compliance with the constraints and specifications above.

- Clarity of the interface. I should be able to use the program, and understand its output, without any explanation on your behalf (and without looking at the code).
- Legibility of the code.