Math 3207 Assignment 1, September 2018

Please show all working and reasoning to get full marks for any question. Hand in your rough working as well so I can see how you investigated and reached your final results. You can use Maple at any point and can email me any worksheets you created.

You are reminded that plagiarism is a serious offense and when it is detected you will be punished. Feel free to discuss the questions in general with myself and your colleagues but the work attempted must be yours alone. A maximum of $20 - \frac{p_y}{2}$ marks can be received for this assignment if you hand your work in y days after the deadline, where p_y is the y^{th} prime number; $p_1 := 2$, $p_2 := 3$, $p_3 := 5$, $p_4 := 7$, $p_5 := 11$, etc.

You have randomly picked one of the two decimal numbers n for question 1.

1. (a) Use the Euclidean Algorithm (either the standard version or the one with negative remainders) to find the greatest common divisor of n and 3043 and then reverse your calculations to get a least linear combination of them. [4]

   (b) Use the sieve of Eratosthenes to find the next 5 primes after $\frac{n}{\gcd(n,3043)}$, showing all stages of your working. [4]

   (c) Explain how the factoring limit (of the maximum prime you have to check) can change when n has more than 2 factors and you find one; how does the limit decrease when you find a factor f and then have to factor $\frac{n}{f}$? Demonstrate this with your number n as you gradually remove factors from it and give the prime power factorisation of n. [3]

   (d) Convert n into dozenal and use long division to divide it by the dozenal number 15 without switching to decimal. [3]

2. (a) Supposing that $z > 1$ and $\gcd(x, z) = 1$, prove by contradiction if $x|y$ then x does not divide into $y + z$. [3]

   (b) If z is zero or one, is (a) still true? If $z > 1$ what is the smallest $\gcd(x, z)$ could be for (a) to not be true? Give an example. [3]

n:= 5032

n:= 4743