# CISC-102 FALL 2016

HOMEWORK 6

Please work on these problems and be prepared to share your solutions with classmates in class next week. Assignments will **not** be collected for grading.

## Readings

Read sections 11.6 of *Schaum's Outline of Discrete Mathematics*.

Read section 6.6 ( Don't worry if the theorems of this section seem daunting. The first 3 pages of the section do give a good explanation of gcd, and lcm.) of *Discrete Mathematics Elementary and Beyond*.

## Problems

(1) Show that any integer value greater than 2 can be written as $3a + 4b + 5c$, where $a, b, c$ are non-negative integers, that is $a, b, c \in \mathbb{Z}, a, b, c \geq 0$. Hint: Use the second form of induction.

(2) Let $a, b \in \mathbb{R}$ . Prove $(ab)^n = a^n b^n$, for all $n \in \mathbb{N}$. Hint: Use induction on the exponent $n$.

(3) Let a = 1763, and b = 42
  - (a) Find $\gcd(a, b)$. Show the steps used by Euclid's algorithm to find $\gcd(a, b)$.
  - (b) Find integers $x, y$ such that $\gcd(a, b) = ax + by$
  - (c) Find lcm(a,b)

(4) Prove $\gcd(a, a + k)$ divides $k$.

(5) If $a$ and $b$ are relatively prime, that is $\gcd(a, b) = 1$ then we can always find integers $x, y$ such that $1 = ax+by$. This fact will be useful to prove the following proposition.

Suppose $p$ is a prime such that $p|ab$, that is $p$ divides the product $ab$, then $p|a$ or $p|b$.