

## Homework 2 - Math 381 A - Winter 2017 - Dr. Matthew Conroy

There are two problems below.

You need to do exactly one of them.

Look at your student id number.

If the right-most digit of your student id number is odd, do problem #1.

If the right-most digit of your student id number is even, do problem #2.

1. Define a graph  $G = (V, E)$  as follows.

Let  $V = \{1, 2, 3, \dots, 10\}$ .

Define  $E = \{(i, j) : i, j \in V, i \neq j, i + 4j \text{ is prime or } j + 4i \text{ is prime}\}$ .

Create and solve (using lpsolve) an IP to find the chromatic number of  $G$ ,  $\chi(G)$ .

2. Define a graph  $G = (V, E)$  as follows.

Let  $V = \{1, 2, 3, \dots, 10\}$ .

Define  $E = \{(i, j) : i, j \in V, i \neq j, i + 5j \text{ is not prime or } j + 5i \text{ is not prime}\}$ .

Create and solve (using lpsolve) an IP to find the chromatic number of  $G$ ,  $\chi(G)$ .

Be sure to give a complete explanation of your method of solution.

Explicitly list your objective function and all constraints in your IP.

Include *all* code you write to solve the problem, and *all* software output.

You are welcome to use any programming language(s).

Note: Suppose  $a$  and  $b$  are positive integers.

We say that  $a$  is a *divisor* of  $b$  if  $b = ak$  for some integer  $k$ .

A *prime* is an integer greater than 1 that has no divisors other than 1 and itself.

The sequence of primes begins 2, 3, 5, 7, 11, . . . .