Math 4513
MATHEMATICA Assignment 4
for class, Friday, September 24

1. Enter the following program into MATHEMATICA, investigate it and explain what the program does:

```
M = 10000;
GapList=;
For[k=1, k<=PrimePi[M],k++,
GapList=Append[GapList,Prime[k+1]-Prime[k]]]
```

   or:

```
gaplist[M1_]:=
(GapList=;
For[k=1, k<=PrimePi[M1],k++,
GapList=Append[GapList,Prime[k+1]-Prime[k]]];
GapList)
```

2. You should be able to use the program in problem 1 together with some basic list commands (see section 1.8 of *The Mathematica Book*) to solve most of problems 4, 5 and 6 from the third MATHEMATICA assignment. Do this.

3. Write a new program or modify the program in problem 1 to determine :
   (a) The number of primes p up to a million (or 100,000 or etc.) for which $p + 2$ and $p + 4$ are prime.
   (b) The number of primes p up to a million for which $p + 2$ and $p + 6$ are prime.
   (c) The number of gaps between primes up to a million with successive sizes 2 and 16.
   (d) The number of successive gaps of size 2, 4 and 6 (or any pattern of your choosing).
   If any of your answers to (a) through (d) seem unusual try to give a mathematical justification for the answer.