## Math 480 - Fall 2020

## Homework 2

Due October 9th, 2020
Why are numbers beautiful? Its like asking why is Beethovens Ninth Symphony beautiful. If you dont see why, someone cant tell you. I know numbers are beautiful. If they arent beautiful, nothing is.

- Paul Erdős


## Turn in:

(1) Use the extended version of Euclid's Algorithm (by hand) to find integers $x$ and $y$ satisfying

$$
119 x+98 y=7
$$

(2) Solve the equation

$$
7 x+4 \equiv 2 \quad(\bmod 22)
$$

(3) Find an integer that simultaneously satisfies the equations

$$
\begin{aligned}
x \equiv 1 & (\bmod 3) \\
x \equiv 3 & (\bmod 5) \\
x \equiv 0 & (\bmod 8) .
\end{aligned}
$$

(4) For each $k>1$, use the Chinese Remainder Theorem to prove that there are $k$ consecutive composite numbers, each divisible by a different one of the first $k$ prime numbers.

