Problem 0.1. Do §4.4 #4(b)(d)(e)

Problem 0.2. Solve the following congruences:

1. \(6x \equiv 6 \pmod{18}\)
2. \(6x \equiv 7 \pmod{18}\)
3. \(6x \equiv 6 \pmod{5^{100}}\)

Problem 0.3. Solve the following simultaneous congruences:

\[
\begin{align*}
x + y & \equiv 1 \pmod{1001} \\
x - y & \equiv 1 \pmod{1001}
\end{align*}
\]

Problem 0.4. Solve the following simultaneous congruences for \(x\) and \(y\) in terms of the constant integers \(a\) and \(b\):

\[
\begin{align*}
x + y & \equiv a \pmod{1001} \\
2x - y & \equiv b \pmod{1001}
\end{align*}
\]

Problem 0.5.

1. Using the modified Euclidean algorithm (c.f. page 108 or lecture notes) to find an integral linear combination of 17 and 41 that equals 1

\[
u17 + v41 = 1 \quad (m, n \in \mathbb{Z})
\]

2. Find all solutions to

\[17x \equiv 1 \pmod{41}\]

3. Find all solutions to

\[41x \equiv 1 \pmod{17}\]
Problem 0.6.

(1) Using the equation
\[ 13 \times 55 = 21 \times 34 + 1 \]
(or \[ 13 \times 55 + (-21) \times 34 = 1 \]) find one solution to the following simultaneous congruences:
\[ x \equiv 0 \pmod{55} \]
\[ x \equiv 1 \pmod{34} \]

(2) We can rewrite \( 13 \times 55 = 21 \times 34 + 1 \) as
\[ (-21) \times 34 = (-13) \times 55 + 1. \]
Use this to find one solution to
\[ x \equiv 1 \pmod{55} \]
\[ x \equiv 0 \pmod{34} \]

(3) Now add appropriate multiples of your two solutions to find one solution to
\[ x \equiv 2 \pmod{55} \]
\[ x \equiv 3 \pmod{34} \]

Problem 0.7. Do §5.1 #6(e).

Problem 0.8. Do §5.1 #10(c).

Problem 0.9. Do §5.2 #1(b)(d).