TYPE YOUR NAME HERE
HW 17: 3.180-3.22
M328K
March 27th, 2012

3.18 Exercise. *Find all solutions in the appropriate canonical complete residue system modulo n that satisfy the following linear congruences:*

1. $26x \equiv 14 \pmod{3}$.

   Solution. Type your solution here! □

2. $2x \equiv 3 \pmod{5}$.

   Solution. Type your solution here! □

3. $4x \equiv 7 \pmod{8}$.

   Solution. Type your solution here! □

4. $24x \equiv 123 \pmod{213}$. *(This congruence is tedious to do by trial and error, so perhaps we should defer work on it for now and instead try to develop some techniques that might help.)*

3.19 Theorem. *Let a, b, and n be integers with $n > 0$. Show that $ax \equiv b \pmod{n}$ has a solution if and only if there exist integers x and y such that $ax + ny = b$.*

Proof. Type your proof here! □

3.20 Theorem. *Let a, b, and n be integers with $n > 0$. The equation $ax \equiv b \pmod{n}$ has a solution if and only if $(a, n)|b$.*

Proof. Type your proof here! □

3.21 Question. *What does the preceding theorem tell us about the congruence* (4) *in Exercise* 3.18 *above?*

Solution. Type your solution here! □

3.22 Exercise. *Use the Euclidean Algorithm to find a member x of the canonical complete residue system modulo 213 that satisfies $24x \equiv 123 \pmod{213}$. Find all members x of the canonical complete residue system modulo 213 that satisfy $24x \equiv 123 \pmod{213}$.*

Solution. Type your solution here! $\square$