§4.1

# WrittenHW #6

TCSS 321

1. [3] Let $a$, $b$, and $c$ be integers, where $a \neq 0$. Prove that if $a|b$ and $b|c$, then $a|c$.
2. [3] Let $a$, $b$, and $c$ be positive integers and $a \neq 0$. Prove or disprove if $a|(bc)$ then $a|b$ or $a|c$.
3. [2] Let $a$ and $b$ be integers such that $a \equiv 11 (\mod 19)$ and $b \equiv 3 (\mod 19)$. Show work done by hand or Sage code used to find:
   (a) the integer $c \in [0, 18]$ such that $c \equiv 13a (\mod 19)$
   (b) the integer $d \in [-18, 0]$ such that $8d \equiv 8b (\mod 19)$
4. [2] Show work done by hand or Sage code used to find the integer $a$ such that:
   (a) $a \equiv 43 (\mod 23)$ and $-22 \leq a \leq 0$
   (b) $a \equiv -1 (\mod 23)$ and $90 \leq a \leq 110$.

§9.5

# WrittenHW #6

TCSS 321

1. [3] Recall that congruence modulo 16 is an equivalence relation.
   (a) Identify five numbers in the equivalence class of $-2 \mod 16$.
   (b) Identify five numbers in the equivalence class of $3 \mod 16$.
   (c) Use set builder notation to describe all the elements in the equivalence class of 3 mod 16.
2. [4] Let $R$ be the relation of logical equivalences on the set of all compound propositions.
   (a) Show $R$ is an equivalence relation.
   (b) Identify two elements that are in the equivalence class of $p \rightarrow q$.
3. [3] Define an equivalence relation on the set of classes offered at UWT.
   (a) Justify why your relation is an equivalence relation.
   (b) Determine the equivalence classes for your relation.

# WrittenHW #6



1. [3] Determine whether the relation $R$ on the set of all real numbers is reflexive, symmetric, antisymmetric, and/or transitive, where $(x, y) \in R$ if and only if:

   (a) $x + y = 0$

   (b) $x = 2y$

   (c) $x = 1$ or $y = 1$

2. [5] Let $R_5$ and $R_6$ be the "congruent modulo 5" and the "congruent modulo 6" relations, respectively, on the set of integers. That is
   $R_5 = \{(a, b) | a \equiv b (\mod 5)\}$ and $R_6 = \{(a, b) | a \equiv b (\mod 6)\}$.

   (a) Use quantifiers and "mod" to write out the set $R_5 \cup R_6$.

   (b) Identify three elements from the set $R_6 \setminus R_5$

   (c) Use quantifiers and "mod" to write out the set $R_5 \oplus R_6$

   (d) Identify three elements from the set $R_5 \circ R_5$

   (e) Identify three elements from the set $R_5 \circ R_6$

3. [2] Define a relation on the set $A = \{0, 1, 2, 5\}$ that is neither symmetric nor antisymmetric.