§4.1 # WrittenHW #5 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 $d \in [0, 18)$ 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 # TCSS 321 Winter 2013

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 $p \to q$.
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.

§9.1 # TCSS 321 Winter 2013

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 $R_6 = \{(a, b) | a \equiv b(\mod 6)\}$. Find:
   (a) $R_5 \cup R_6$
   (b) $R_6 \setminus R_5$
   (c) $R_5 \oplus R_6$
   (d) $R_5 \circ R_5$
   (e) $R_5 \circ R_6$
3. [2] Define a relation on the set $A = \{0, 1, 2, 5\}$ that is neither symmetric nor antisymmetric.

§9.4 # TCSS 321 Winter 2013

1. [3] §9.4 #6
2. [3] Find the symmetric closures of the relations with the directed graph shown in problem 1.
3. [4] Let R be the relation on the set $\{1, 2, 3, 4, 5\}$ containing the ordered pairs $(1, 3)$, $(2, 4)$, $(3, 1)$, $(3, 5)$, $(4, 3)$, $(5, 1)$, $(5, 2)$, and $(5, 4)$. Find the transitive closure or R.