

Quiz 3

Show *all* your work. No credit is given without reasonable supporting work. There are *two* sides to this quiz.

1. [4] TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true and briefly justify your answer. Otherwise, circle F and provide a counterexample or brief reasoning.

T F (Suggested §4.1 #37b) Let a , b , and c be integers.
If $a \equiv b \pmod{6}$ and $c \equiv d \pmod{6}$, then $a^c \equiv b^d \pmod{12}$.

T F (HW5 §9.1 #3) If R is a relation that is not symmetric,
then R must be anti-symmetric.

2. Let R be a relation on the integers, \mathbb{Z} , defined by aRb if $a \equiv b \pmod{8}$.

(a) [2] (HW5 §4.1 #4) Identify a number in the congruence class of 3 that is between -25 and -15 .

(b) [4] (HW5 §9.5 #2) Determine if R is an equivalence relation. If not, explain what property R failed. If so, *briefly* justify that R satisfies the necessary properties.

3. [4] Define a relation T that is anti-symmetric, but not symmetric or reflexive.
4. (Suggested §9.1 #3) Consider the relation S on the set $A = \{1, 2, 3, 4\}$ defined by $S = \{(1, 1), (1, 2), (1, 3), (2, 3), (3, 1)\}$
- (a) [2] Determine if S is anti-symmetric. Justify your answer.
- (b) [2] (relations wks #4) Find $S \circ S$ or S^2
- (c) [2] (Suggested §9.4 #3) Find the symmetric closure of S .