

Your name Here:

CSCI 2824 –

Relations

1. Determine whether each of the following relations $R \subseteq A \times A$, where A is the set of all CU students, is reflexive, symmetric, transitive, and/or an equivalence relation. Briefly justify each conclusion.
 - (a) $(a, b) \in R$ if and only if a shares at least one class with b .
 - (b) $(a, b) \in R$ if and only if a has a higher GPA than b .
 - (c) $(a, b) \in R$ if and only if a lives in the same home as b .

2. Consider the relation $R = \{(1, 1), (2, 2), (3, 3), (3, 1), (3, 4), (4, 4), (4, 1), (4, 3)\}$, where $R \subseteq A \times A$, with $A = \{1, 2, 3, 4\}$.
- (a) Draw the graph of R . **Note:** If possible, it is good practice to organize your graph such that all directed edges are non-intersecting.
 - (b) Is the relation R reflexive? Symmetric? Transitive? An equivalence relation? Fully justify your responses.
 - (c) The **complement** of a relation $R \subseteq A \times A$ is defined as $\overline{R} = (A \times A) - R$.
 - i. What is the set \overline{R} for R as defined in this problem?
 - ii. Is the following statement true or false? Briefly justify your conclusion. "A relation R is symmetric **if and only if** its complement \overline{R} is symmetric."

3. Do the proof of example 3 on page 609 in your OWN WORDS AND METHODS. You can make this more straightforward I believe. Notice the “if and only if” elements. You may use Definition and Theorems from page 240-241.