Name ________________________________

Row 1 2 3 4 5

Homework 14B
CS 313H

The important issue is the logic you used to arrive at your answer.

1. Let A be any set and R a symmetric relation on A. Prove that for $n \geq 1$, R^n (the n^{th} order composition of R with itself) is symmetric. (Recall $R^1 = R$ and for $n \geq 1, R^{n+1} = R^n \circ R$.)

2. Let A be any set and R a relation on A. Prove that the reflexive closure of R is $R \cup I$. (Remember you must show that $R \cup I$ is reflexive and that, if $R \subseteq \overline{R} \subseteq R \cup I$ and $\overline{R}$ is reflexive, then $\overline{R} = R \cup I$.)

3. Let A be any set and R a relation on A. Prove that the symmetric closure of R is $R \cup R^{-1}$. (Remember you must show that $R \cup R^{-1}$ is symmetric and that, if $R \subseteq \overline{R} \subseteq R \cup R^{-1}$ and $\overline{R}$ is symmetric, then $\overline{R} = R \cup R^{-1}$.)

4. Specify the transitive closure of the following relations:

a. Let $A = \{living\ people\}$ and $R = \{(x, y) \in A \times A : x is a child of\ y\}$

b. Let $B = \{x : x \in \mathbb{N} \wedge x \leq 100\}$ and $S = \{(x, y) \in B \times B : y = x + 1\}$

c. Let $C = \{1,2,3,4,5\}$ and $T = \{(1,2),(1,4),(2,5),(5,3)\}$