# CSci 1302 Assignment 12

**Due Friday, May 9th in class**

**Problem 1 (6 points)**. You are given three sets, $A = \{a, b, c\}$, $B = \{1, 2, 3\}$, and $C = \{red, white, blue\}$, and the following relations:

- $R \subseteq A \times B = \{(a, 1), (b, 1), (c, 3)\}$,
- $S \subseteq B \times C = \{(1, red), (2, blue), (3, red)\}$,
- $T \subseteq C \times A = \{(red, a), (white, c)\}$.

For each of the following operations compute the result if the operation makes sense, or, if it doesn't make sense, please explain why.

1. $R; S$
2. $S; T$
3. $R; R^{-1}$
4. $R^{-1}; R$
5. $R^{-1}; T^{-1}$
6. $R; T$

**Problem 2 (6 points).** Exercises 17, 19, 22 p. 593.

**Problem 3 (4 points).** Exercises 4, 11 p. 608.

**Problem 4 (5 points)** You are given relation $R = \{(a, b), (b, c), (c, b), (d, c)\}$ on the universal set $U = \{a, b, c, d, e\}$. Please construct the following:

- the reflexive closure of $R$.
- the symmetric closure of $R$.
- the transitive closure of $R$.
- the "equivalence closure" of $R$ (i.e. the smallest equivalence relation that contains $R$).

You may list pairs included in the resulting relations or draw the realtions, each as a separate diagram.

**Problem 5 (2 points)**. Is symmetric closure of a transitive relation transitive? If yes, please prove it. If not, please give a counterexample.

**Problem 6 (3 points)**. Exercises 6, 7, 9 p. 647.

**Problem 7 (6 points)**. Exercise 2 p. 680.

**Problem 8 (2 points)**. Exercises 3b, 5b p. 696.

**Problem 9 (6 points)**. Exercise 19 p. 696.

That's all, folks!