MATH 245 S21, Exam 3 Questions

(60 minutes, open book, open notes)

1. Question 1 is just instructions; this is a weird requirement of Gradescope.

2. Question 2 asks for your favorite different real numbers a, b, c, and defines sets $S = \{a, b, c\}$ and $T = \{a + b, a + c\}$.

3. Let S, T be as defined in Question 2, and $R = \{x \in \mathbb{R} : 1 < x^2 \leq 10\}$. Prove or disprove that $S \subseteq R \cup T$.

4. Let S, T be as defined in Question 2. (i) Find any nonempty $R_1 \subseteq S \Delta T$; (ii) Find any nonempty $R_2 \subseteq S \times T$; and (iii) Find any partition of $S \times T$.

5. Let S, T be as defined in Question 2. Consider relation R on $S \cup T$ given by $R = \{(x, y) : x \geq |y - 1|\}$. Draw this relation as a digraph, and determine whether or not it is antisymmetric.

6. Let S, T be as defined in Question 2. Find a relation R on $S \cup T$ that is symmetric, not reflexive, and not trichotomous, but where $R|_T$ is reflexive and trichotomous. Give R both as a set and as a digraph.

7. This problem no longer uses S, T from Question 2. Prove or disprove: For all sets A, B, C, we must have $B \cap C \subseteq (A \setminus B) \Delta C$.

8. This problem no longer uses S, T from Question 2. Prove or disprove: For all sets A, B, we must have $2^A \Delta 2^{(A \Delta B)} = 2^B$.