

# MATH 2100 / 2105 / 2350 – HOMEWORK 12 (LAST ONE!)

due Thursday, **December 6**, at the beginning of class

*This homework assignment was written in L<sup>A</sup>T<sub>E</sub>X. You can find the source code on the course website.*

**Instructions:** This assignment is due at the *beginning* of class. **Staple your work** together (do not just fold over the corner). Please write the questions in the correct order. If I cannot read your handwriting, you won't receive credit. Explain all reasoning.

**For each relation below, answer the following questions. You must, as always, prove your answer.**

- (a) Is it reflexive?
- (b) Is it irreflexive?
- (c) Is it symmetric?
- (d) Is it antisymmetric?
- (e) Is it transitive?
- (f) Is it a partial order? If so, draw the Hasse diagram.
- (g) Is it an equivalence relation?

1.  $S = \mathcal{P}(\{1,2,3\})$  and  $R = \{(A,B) \in S \times S : A \cap B \neq \emptyset\}$

2.  $S = \mathcal{P}(\{1,2,3\})$  and  $R = \{(A,B) \in S \times S : A \cup B \neq \emptyset\}$

3. For a finite set  $S$  of numbers, define  $\Sigma(S)$  to be the sum of the numbers in  $S$ .  
 $S = \mathcal{P}(\{1,2,3,4\})$  and  $R = \{(A,B) \in S \times S : \Sigma(A) \leq \Sigma(B)\}$

4.  $S = \{0,1,2,3,4,5,6,7,8,9,10\}$  and  $R = \{(a,b) \in S \times S : |a - b| = 4\}$

5.  $S = \{\text{Marquette Students}\}$  and  $R = \{(a,b) \in S \times S : \text{the first letters of the last name of students } a \text{ and } b \text{ are the same}\}$

6.  $S = [0,2\pi)$  and  $R = \{(a,b) \in S \times S : \cos(a) = \cos(b)\}$