Math 265
April 3, 2022

Ch 11: Relations

1. State the definitions of
   (a) a relation R on a set A.
   (b) a reflexive relation
   (c) a symmetric relation
   (d) a transitive relation
   (e) an equivalence relation

2. Let $n \in \mathbb{N}$. Prove that the relation R on $\mathbb{Z}$ defined as $a \, R \, b$ if $a \equiv b \bmod n$ is transitive.

3. For each relation below, determine whether it is reflexive, symmetric, or transitive.

   (a) $R = \{(x, y) \in \mathbb{R} \times \mathbb{R} \mid x^2 + y^2 \leq 4\}$

   (b) R is a relation on $\mathcal{P}(\mathbb{N})$ such that ARB if $|A - B| \leq 2$.

(c) R is a relation on $\mathcal{P}(\mathbb{N})$ such that ARB if $A - \{1, 2\} = B - \{1, 2\}$.

(d) R is a relation on $\mathbb{Z}$ defined as $(m, n) \in R$ if $3m - 5n$ is even.