1. Quick Review
   (a) R is a relation on A if

   (b) Suppose R is a relation on the set A.

      i. We say R is **symmetric** if

      ii. We say R is **reflexive** if

      iii. We say R is **transitive** if

   (c) What properties do the following relations have?

      i. Let R be a relation on $\mathbb{N} \times \mathbb{N}$ such that $(a,b)R(c,d)$ if $ad = bc$.

      ii. Let R be a relation on $A = \mathbb{Z}$ defined by $a\,R\,b$ if $a \equiv b \pmod 3$.

      iii. Suppose R is a relation on $\mathscr{P}(A)$ where $A = \{0,1,2,3,4\}$ defined as $X\,R\,Y$ if $X \cap Y \neq \emptyset$.

2. A relation R on set A is an **equivalence relation** if

3. Build your own equivalence relation on $A = \{a,b,1,5\}$.

4. For each relation below, quickly confirm the relation **is** an equivalence relation, then identify its equivalence classes using the square bracket notation **in two different ways** and by describing them as sets. Can you describe the partition of A that is produced?

   (a) Let R be a relation on $A = \mathbb{Z}$ defined by $a\,R\,b$ if $a \equiv b \pmod 6$.

   (b) Let R be a relation on the set of all polynomials with real coefficients defined by $p(x)Rq(x)$ if the degree of $p(x)$ equals the degree of $q(x)$.

   (c) Let R be the set of differentiable functions $f : \mathbb{R} \to \mathbb{R}$ defined by by $f(x)Rg(x)$ if $f'(x) = g'(x)$.

5. Suppose R and S are two equivalence relations on A. Answer the following questions **rigorously**.

   (a) Is the set $R \cup S$ an equivalence relation on A?

   (b) Is the set $R \cap S$ an equivalence relation on A?