1. Verify if the following formulas are tautologies:
$(p \vee (q \wedge r)) \Rightarrow ((r \vee p) \wedge (p \vee q))$
$((p \Leftrightarrow q) \Leftrightarrow (p \Leftrightarrow p)) \Leftrightarrow (p \Leftrightarrow (q \Leftrightarrow p))$

2. Let $X = \{21, 23, 25, \ldots, 299\}$ be the set of odd integers lying between 20 and 300. Find the number of elements of the following set:
$Y = \{n \in X : ((3|n) \Rightarrow (n = 165)) \vee ((11|n) \Rightarrow (n = 165))\}$

3. Find the union $\bigcup_{n \in \mathbb{N} \cup \{0\}} A_n$ and intersection $\bigcap_{n \in \mathbb{N} \cup \{0\}} A_n$ of the sets

$$A_n = \left\langle 2 - \frac{1}{n^2 - 3}; 5 - \frac{1}{n+2} \right\rangle.$$

4. Prove that the relation R defined on the set $X = \mathbb{Z}$ by

$mRn \equiv (2m)^2 + (3n)^2$ is divisible by 13

is an equivalence relation. Determine its equivalence classes $[0]_R, [9]_R$. How many different equivalence classes does this relation have?