Tutorial 2

CSCI2110/MATH2080: Discrete Mathematics
1.3 - Propositional Equivalence
1.4 - Predicates and Quantifiers

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Check that the following are logically equivalent. You may use truth tables or identities.

1. $\neg p \rightarrow (q \rightarrow r) \equiv q \rightarrow (p \vee r)$
2. $((p \vee q) \wedge (p \rightarrow r) \wedge (q \rightarrow r)) \rightarrow r \equiv \top$

Question 2 - Negate Statements

Negate the following statements. Write the original statement and its negation using variables.

1. Jan is rich and happy.
2. Every koala can climb.
3. There is no one in this class who knows French and Russian.
4. Rita will move to Oregon or Washington.
5. Somebody in this class has a pet hamster.

Question 3 - Propositional Logic True or False

True or false:

1. $\neg(p \oplus q)$ is logically equivalent to $p \iff q$.
2. $\neg(q \wedge (p \to q)) \to \not{p}$ is a tautology.
3. If p represents the statement "James known Python" and r represents the statement "James knows Rust", then the negation of "James knows Python and Rust" is $\neg(p \wedge q)$.

Find a compound proposition involving the propositional variables p, q, and r that is true when exactly two of p, q, and r are true and is false otherwise.