Homework 1. Basic Logic

Each problem is worth 10 points

[10] Make truth tables for the following statements:

1. \( p \lor (\neg r \lor q) \);
2. \((p \land \neg q) \rightarrow r \).

[10] Using logical equivalences discussed in class prove that

\[(p \land q) \rightarrow (p \lor q)\]

is a tautology, that is, prove that

\[(p \land q) \rightarrow (p \lor q) \equiv T.\]

[10] Let

\[P(x, y) : x + y \geq 5\] where \(x, y\) positive integers.

Tell whether the following statements are true or false:

- \(\forall x \forall y \ P(x, y)\)
- \(\forall x \exists y \ P(x, y)\).

[10] Which of the following is equivalent to \(\forall x \exists y \ P(x, y)\):

(a) \(\exists x \forall y \ P(x, y)\);
(b) \(\forall x \exists y \ P(x, y)\);
(c) \(\exists x \forall y \ P(x, y)\);
(d) \(\exists x \exists y \ P(x, y)\).