# Lógica Computacional 1 Exercícios – Semântica

UnB/IE/CIC

Turma 01 - 2024/2

1. Verifique se as seguintes afirmações são verdadeiras:
   (a) $\models_{\mathcal{L}_p} ((p \to q) \to p) \to p$
   (b) $\models_{\mathcal{L}_p} p \vee \neg(q \wedge (r \to q))$
   (c) $\models_{\mathcal{L}_p} (p \wedge q) \to (p \vee q)$
   (d) $\models_{\mathcal{L}_p} ((p \to \neg q) \to \neg p) \to q$
   (e) $\models_{\mathcal{L}_p} (p \to q) \vee (p \to \neg q)$
   (f) $\models_{\mathcal{L}_p} ((p \to q) \to p) \to q$
   (g) $\models_{\mathcal{L}_p} ((p \vee q) \to r) \to ((p \to r) \vee (q \to r))$
   (h) $\models_{\mathcal{L}_p} (p \to q) \to (\neg p \to \neg q)$
2. Mostrar que as seguintes relações se verificam:
   (a) $\{(p \wedge q) \wedge r\} \models_{\mathcal{L}_p} p \wedge (q \wedge r)$
   (b) $\{q \to (p \to r), \neg r, q\} \models_{\mathcal{L}_p} \neg p$
   (c) $\models_{\mathcal{L}_p} (p \wedge q) \to p$
   (d) $\{p\} \models_{\mathcal{L}_p} (p \to q) \to q$
   (e) $\{(p \to r) \wedge (q \to r)\} \models_{\mathcal{L}_p} p \wedge q \to r$
   (f) $\{q \to r\} \models_{\mathcal{L}_p} (p \to q) \to (p \to r)$
   (g) $\{p \to q, r \to s\} \models_{\mathcal{L}_p} p \vee r \to q \vee s$
   (h) $\{(p \vee (q \to p)) \wedge q\} \models_{\mathcal{L}_p} p$
   (i) $\{p \to q, r \to s\} \models_{\mathcal{L}_p} p \wedge r \to q \wedge s$
   (j) $\{p \to q \wedge r\} \models_{\mathcal{L}_p} (p \to q) \wedge (p \to r)$
   (k) $\{p \vee (p \wedge q)\} \models_{\mathcal{L}_p} p$
   (l) $\{p \to (q \vee r), q \to s, r \to s\} \models_{\mathcal{L}_p} p \to s$
   (m) $\{(p \wedge q) \vee (p \wedge r)\} \models_{\mathcal{L}_p} p \wedge (q \vee r)$
3. Mostrar se as seguintes afirmações são verdadeiras (ou não):
   (a) $\{\neg p \to \neg q\} \models_{\mathcal{L}_p} q \to p$
   (b) $\{\neg p \vee \neg q\} \models_{\mathcal{L}_p} \neg(p \wedge q)$
   (c) $\{\neg p, p \vee q\} \models_{\mathcal{L}_p} q$
   (d) $\{p \vee q, \neg q \vee r\} \models_{\mathcal{L}_p} p \vee r$
   (e) $\{p \to (q \vee r), \neg q, \neg r\} \models_{\mathcal{L}_p} \neg p$
   (f) $\{\neg p \wedge \neg q\} \models_{\mathcal{L}_p} \neg(p \vee q)$
   (g) $\{p \wedge \neg p\} \models_{\mathcal{L}_p} \neg(r \to q) \wedge (r \to q)$
   (h) $\{p \to q, s \to t\} \models_{\mathcal{L}_p} (p \vee s) \to (q \wedge t)$
   (i) $\{\neg(\neg p \vee q)\} \models_{\mathcal{L}_p} p$
   (j) $\{\neg p \vee (q \to p)\} \models_{\mathcal{L}_p} \neg p \wedge q$

(k) $\{\neg r \to (p \vee q), r \wedge \neg q\} \models_{\mathcal{L}_p} r \to q$

(l) $\{p \to (q \to r)\} \models_{\mathcal{L}_p} p \to (r \to q)$

(m) $\{\neg p, p \vee q\} \models_{\mathcal{L}_p} \neg q$

(n) $\{p \to (q \vee r)\} \models_{\mathcal{L}_p} (p \to q) \wedge (p \to r)$

4. Mostrar se as seguintes afirmações são verdadeiras ou não:

(a) $\{p \leftrightarrow q, q\} \models_{\mathcal{L}_p} p$

(b) $\{p \vee q\} \models_{\mathcal{L}_p} p \to \neg q$

(c) $\{p \to q, r \to \neg q\} \models_{\mathcal{L}_p} p \vee q$

(d) $\{p \to r, q \to \neg r\} \models_{\mathcal{L}_p} p \vee q$

(e) $\{p \to r, q \to \neg r\} \models_{\mathcal{L}_p} \neg(p \wedge q)$

(f) $\{p \to q, p \to \neg q\} \models_{\mathcal{L}_p} \neg p$

(g) $\{\neg p \to p\} \models_{\mathcal{L}_p} p$

(h) $\{(p \to q) \wedge (p \to r), \neg q \vee \neg r\} \models_{\mathcal{L}_p} \neg p$

(i) $\{(p \to q) \wedge (r \to q), p \vee r\} \models_{\mathcal{L}_p} q$

(j) $\{(p \wedge q) \to r, \neg r, p\} \models_{\mathcal{L}_p} \neg q$

(k) $\{p \to (\neg q \vee \neg r), s \to (q \wedge r)\} \models_{\mathcal{L}_p} s \to \neg p$