Q1. Write out the truth table to prove:
(a) \((P \land Q)' = P' \lor Q'\)
(b) \(P \lor (Q \land R) = (P \lor Q) \land (P \lor R)\)
(c) \(P \lor Q \Rightarrow R \equiv (P \Rightarrow R) \land (Q \Rightarrow R)\)

Q2. Write out the negation for each statement:
(a) Some footballers are short.
(b) All the lights are on.
(c) No bounded interval contains infinitely many integers.
(d) \(\exists x \in S \text{ such that } x \geq 5\)
(e) \(\forall x \text{ such that } 0 < x < 1, \frac{1}{x} > 2 \text{ or } \frac{1}{x} > 5\)
(f) \(\exists x > 5, \text{ then } \exists y > 0 \text{ such that } x^2 > 25 + y\)

Q3. (a) If \(A_1, A_2, A_3, \ldots, A_n, \ldots\) are sets:
(A) If \(A_1 \subset A_2 \subset A_3 \subset \cdots \subset A_n \subset \cdots\)
Find \(\liminf A_n\) and \(\limsup A_n\).
(B) If \(A_1 \supset A_2 \supset A_3 \supset \cdots \supset A_n \supset \cdots\)
Find \(\liminf A_n\) and \(\limsup A_n\).

Due: Monday 23 rd.