MATH 220.201 CLASS 3 QUESTIONS

(1) For each of the following sentences, say whether it is a *statement* or an *open sentence*. Can you state its negation?
  (a) 5 is even or 3 is prime.
  (b) At least one of my two friends misplaced his/her homework assignment.
  (c) For any polyhedron, the number of vertices plus the number of faces equals the number of edges plus 2.
  (d) If $x^4 = 1$, then $x = 1$ or $x = -1$.
(2) Construct a truth table in P, Q for the compound statement $(P \vee Q) \wedge \sim (P \wedge Q)$.[1]
(3) Construct a truth table in P, Q for the statement $P \implies Q$. Can you construct a compound statement with the same truth table using only $\sim, \vee$, and $\wedge$?
(4) Let $A = \{3, 6, 8, 9, 11\}$ and $B = \{6, 9, 10\}$. Find all sets S of integers such that the following statement holds true for all integers x.

$$(x \in S) \implies (x \in A) \wedge (x \in B)$$

Is there a set S such that $(x \in S) \iff (x \in A) \wedge (x \in B)$?

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[1]This is sometimes called 'exclusive or', or 'xor'.