DISCRETE MATHEMATICS, CLASS EXERCISE 1

(1) Is the logical form $p \wedge (q \vee \neg p) \wedge \neg q$ a contradiction? Include a truth table and a few words explaining how the truth table supports your answer.

(2) Represent the propositions below symbolically by denoting with {p: You heard the "Flying Pigs" concert.}, {q: You heard the "Y3K" concert.}, {r: You have sore eardrums.}
a) You heard the 'Flying Pigs" concert or the "Y3K" concert, but you do not have sore eardrums.
b) You did not hear the 'Flying Pigs" concert and you did not hear the "Y3K" concert, but you have sore eardrums.
c) It is not the case that: You heard the 'Flying Pigs" concert or the "Y3K" concert or you do not have sore eardrums.

(3) Prove (or disprove) that $S \equiv T$: $S = (p \to q) \wedge (q \to r)$, $T = p \to r$.

(4) Write the contrapositive, the inverse, the converse and the negation of the following sentence: "If the variable is undeclared then the program will cycle into an infinite loop."