1. Consider this propositional logic. Assume that \sim is negation.

$$\sim_y V \sim_u V \sim_s V q$$

Select all true statements.

- a) The statement is a Horn clause ^T
- b) The statement is a definite clause T
- c) The statement is logically equivalent to \sim y $V \sim$ u $V \sim$ s \rightarrow q
- d) The statement is logically equivalent to $\sim y \land \sim u \land \sim s \Rightarrow q$
- e) The statement is logically equivalent to y \wedge u \wedge s \rightarrow q
- f) The statement is logically equivalent to $\sim q \wedge u \wedge s \rightarrow \sim y$

2. Select all inferences that are valid logical inferences. That is, the clause below the line logically follows from (i.e., $\vdash or \models$) the clause(s) above the line.

T b)
$$\frac{p, \sim p \lor q \lor r}{q \lor r}$$

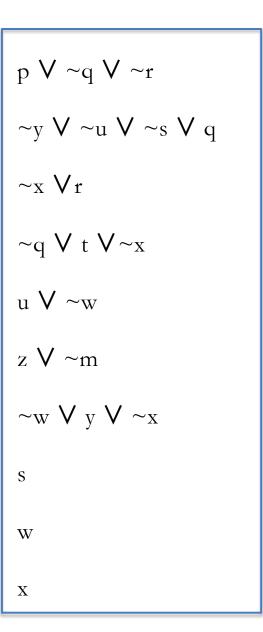
T c)
$$\frac{p \land \sim q \rightarrow s, p \land \sim q}{s \lor r}$$

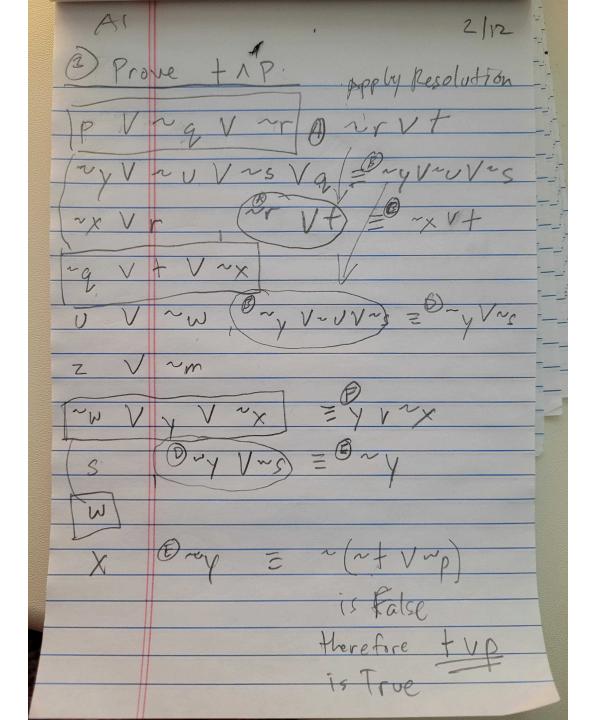
T d)
$$\frac{p \land \sim q \rightarrow s, p \land \sim q}{s}$$

$$\mathsf{T} \quad e) \frac{p \vee q \vee s, \sim p \vee q \vee r}{q \vee s \vee r}$$

T f)
$$\frac{p \land \neg q \land r}{p \land r}$$

3. Consider the propositional knowledge base, KB. Prove ($t \land p$) by contradiction using resolution (resolution refutation) with a set-of-support strategy.





4. Select all statements that are true.

- Fa) Creating a machine that thinks like a human is definitional of the field of artificial intelligence
- Tb) Anytime search continues to search for solutions after finding the first solution
- Fc) The most challenging task environments for AI are fully observable, single agent, deterministic, episodic, and discrete.
- Td) The runtime cost of a depth-bounded depth-first search is O(B*D), where B is the branching factor and D is the depth bound
- Fe) Macro operators are guaranteed of reducing search costs because their use reduces the effective depth of search.
- Tf) Increased heuristic accuracy effects search costs by reducing the effective branching factor of search.
- Tg) Logical state estimation is the process of updating the belief state as new percepts arrive

5. Select all statements that are true.

- Fa) WalkSAT conducts an iterative deepening depth first search in pursuit of a proof of satisfiability
- Fb) Modus Ponens is the sole basis of a complete inference algorithm when paired with iterative deepening
- Tc) The path between a start state and a descendant state M can be recovered through M's SearchNode parent link, and subsequent ancestor links -- this mitigates redundancy in path storage
- Td) Nondeterministic algorithms can be slow due to search, but they can be elegant and simply stated too, and machine learning can speed them up
- Fe) Heuristic admissibility applies straightforwardly to utility-driven search
- Ff) The generalized arc consistency (GAC) procedure is guaranteed to find one or more solutions to any n-ary constraint satisfaction problems
- Tg) In contrast to offline search, online search interleaves computation and action