Name:

PID:

1. Characterize the following as being decidable, c.e., co-c.e., partial computable, or apparently none of these.

When discussing a “least formula” or “least proof”, we mean that strings are ordered (a) first by length, and (b) second by lexicographic (alphabetic) order according to some ordering of the alphabet $\Sigma$.

(a) The set of propositional formulas that have a PL-proof. Decidable.

(b) The function that maps a propositional formula $A$ to its least PL-proof, or to $\epsilon$ if $A$ does not have a proof. Computable.

(c) The function that maps a propositional formula $A$ to the least formula $B$ which is tautologically equivalent to $A$. Computable.

(d) The set of first-order sentences that have a FO-proof. Co-c.e.

(e) For a fixed first-order sentence $A$, the set of sentences that are logically equivalent to $A$. C.e.

(f) The set of finite sets $\Pi$ of first-order sentences which are consistent. Co-c.e.

(g) The set of finite sets $\Pi$ of first-order sentences which are inconsistent. Computable enumerable (Semidecidable).

(h) The function that maps a first-order sentence $A$ to its least FO-proof. Partial computable.

(i) The function that maps a first-order sentence $A$ to the least sentence $B$ which is logically equivalent to $A$.

For (e): Enumerate all valid proofs of sentences of the form $(A \rightarrow C)$.

(h) Search through all proofs in $\leq$-order, output the first valid proof of $A$ (if any).