

Quiz 3

Your name:

Write neatly and be careful. Questions will be worth varying numbers of points. Remember that decidable = Turing decidable = recursive; and that acceptable = Turing acceptable = r.e. = recursively enumerable. Remember that $A_{TM} = \{\langle M, w \rangle : TM M \text{ accepts } w\}$.

1. Give a precise **definition** for what it means to say: “language L is Turing decidable”.

2. Give a precise **definition** for $A \leq_m B$ (“language A many-one reduces to language B ”):

3. According the conventions used in class, a TM is a 7-tuple $M = (Q, \Sigma, \Gamma, \delta, q_0, q_{\text{accept}}, q_{\text{reject}})$ where $\delta : \boxed{} \rightarrow \boxed{}$. (Fill in the domain and range).

4. Fill in **solid** the **correct** answer. No explanation is needed.

(a) A_{TM} is r.e.	<input type="checkbox"/> True	<input type="checkbox"/> False
(b) A_{TM} is co-r.e.	<input type="checkbox"/> True	<input type="checkbox"/> False
(c) If $A \leq_m B$ and B is decidable then A is decidable.	<input type="checkbox"/> True	<input type="checkbox"/> False
(d) If $A \leq_m B$ and A is decidable then B is decidable.	<input type="checkbox"/> True	<input type="checkbox"/> False
(e) To show L undecidable, it suffices to show $A_{TM} \leq_m L$.	<input type="checkbox"/> True	<input type="checkbox"/> False
(f) $L = \{\langle M \rangle : M \text{ is a TM and } L(M) \text{ is finite}\}$ is decidable.	<input type="checkbox"/> True	<input type="checkbox"/> False
(g) $L = \{\langle M \rangle : M \text{ is a TM and } L(M) \text{ is r.e.}\}$ is decidable.	<input type="checkbox"/> True	<input type="checkbox"/> False
(h) $L = \{\langle G \rangle : G \text{ is a CFG and } L(G) = \emptyset\}$ is decidable.	<input type="checkbox"/> True	<input type="checkbox"/> False
(i) Suppose $A \leq_m B$ and $B \leq_m A$. Then $A = B$.	<input type="checkbox"/> True	<input type="checkbox"/> False
(j) If $A \leq_m B$ and $B \leq_m C$ then $A \leq_m C$.	<input type="checkbox"/> True	<input type="checkbox"/> False
(k) If A is context free then it is r.e.	<input type="checkbox"/> True	<input type="checkbox"/> False
(l) If A is regular then $A \leq_m \{0, 1\}$.	<input type="checkbox"/> True	<input type="checkbox"/> False