1. A PDA $M = (Q, \Sigma, \Gamma, \delta, q_0, F)$ has $|Q| = 10$ states and $|\Sigma| = 2$ characters in the input alphabet and $|\Gamma| = 5$ characters in the tape alphabet. Then there are ________ points in the domain of $\delta$ and ________ points in the range of $\delta$.

2. State the Church-Turing thesis:

3. Let $A$ and $B$ be languages. Define $A \leq_m B$ ($A$ many-one reduces to $B$):

4. When we define the language $A_{TM} = \{ \langle M, w \rangle : \text{TM } M \text{ accepts } w \}$, what is the purpose of the angle brackets (the $\langle \rangle$ symbols) that surround $M, w$?

5. Darken the correct box. No justification is required. If you’re not sure, guess.

   (a) True False  If $L$ is recursive then so is its complement, $\overline{L}$.
   (b) True False  If $L^*$ is recursive than $L$ is recursive.
   (c) True False  If $L$ is context free then a queue automata (QA) can decide it.
   (d) True False  The r.e. languages are closed under complement.
   (e) True False  $L = \{ \langle M \rangle : L(M) \neq \emptyset \}$ is Turing-acceptable (r.e.)
   (f) True False  $L = \{ a^n b^n : n \geq 1 \}$ is co-r.e.
   (g) True False  If $\Pi \leq_m L$ and $\Pi$ is undecidable than $L$ is undecidable.
   (h) True False  To show that $L$ is not r.e., it suffice to show that $A_{TM} \leq_m L$.
   (i) True False  To show that $L$ is not r.e., it suffice to show that $\overline{A}_{TM} \leq_m L$.
   (j) True False  A language $L$ is either r.e. or co-r.e..
   (k) True False  The Turing-acceptable languages are closed under intersection.
   (l) True False  The Turing-acceptable languages are closed under set difference.