ECS 120: Theory of Computation — Quiz 2
UC Davis — Phillip Rogaway — May 15, 2015

First: [   ] **LAST:** [   ] **Seat Letter:** [   ] **Number:** [   ]

1. Prove that that CFG $S \to 0 \mid 1 \mid S \cup S$ is **ambiguous**. An appropriate and minimal **picture** will suffice.

2. A PDA $M = (Q, \Sigma, \Gamma, \delta, q_0, F)$ has transition function δ: [   ] $\rightarrow$ [   ].
(*Fill in the domain and range.*) Thus if $Q = \{q_0, q_1, q_2, q_3, q_4\}$ and $\Sigma = \{a, b, c\}$ and $\Gamma = \{A, B, C, \$\}$ then the domain of δ has [   ] points and its range has [   ] points. (*Answers are numbers.*)

3. Define what it means for a language L to be **recursive** (or **decidable**). (Don't use the word *decides* in your answer.)

4. State the **Church-Turing thesis**.

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

(a) **True** **False** The CFLs are closed under homomorphism.
(b) **True** **False** Every context-free language has a context-free complement.
(c) **True** **False** If L is regular and nonempty then L has an ambiguous CFG.
(d) **True** **False** Given CFGs G_1 and G_2, there's an algorithm to decide if $L(G_1) = L(G_2)$.
(e) **True** **False** If L is context free and R is regular then $L \cap R$ is context free.
(f) **True** **False** $\{w \in \{a, b, c\}^* : w$ has an equal numbers of a's, b's, and c's $\}$ is context free.
(g) **True** **False** The set of all regular expressions over $\{0, 1\}$ is context free.
(h) **True** **False** The pumping lemma can be used to show that a language is context free.
(i) **True** **False** If L^* is context free then L is context free.
(j) **True** **False** Every context-free languages is decidable.
(k) **True** **False** If M is a TM and x a string then M either accepts x or rejects x.
(l) **True** **False** Every decidable language is r.e..