

Name & Directory ID: _____

Circle Your Section!			
0101 (10am: 3120, Ladan)	0102 (11am: 3120, Ladan)	0103 (Noon: 3120, Peter)	
0201 (2pm: 3120, Yi)	0202 (10am: 1121, Vikas)	0203 (11am: 1121, Vikas)	0204 (9am: 2117, Karthik)
0301 (9am: 3120, Huijing)	0302 (8am: 3120, Huijing)	0303 (1pm: 3120, Yi)	250H (10am: 2117, Peter)

1. (40 points) Consider the following propositions:

p : Unicorns exist.

q : I am a student at University of Maryland.

r : Robot monkeys are eating my brains!

s : Gene Simmons is *not* my instructor.

Write each sentence below as a compound proposition using $\{p, q, r, s\}$ and the logical connectives $\{\vee, \wedge, \neg, \rightarrow, \leftrightarrow\}$. Decide whether each sentence is true or false in the context of the current world we live in. Show your work.

- (a) Either unicorns exists, or I am a student at University of Maryland, or both.
- (b) I am a student at University of Maryland if and only if Gene Simmons is not my instructor.
- (c) If I am a student at University of Maryland, then Gene Simmons is not my instructor.
- (d) Gene Simmons is not my instructor if robot monkeys are eating my brains!
- (e) Gene Simmons is not my instructor only if robot monkeys are eating my brains!
- (f) If unicorns exist, then robot monkeys are eating my brains!
- (g) If Gene Simmons *is* my instructor and robot monkeys *don't* eat my brains, then neither do unicorns exist nor am I a student at University of Maryland.

2. (60 points) A proposition is a *tautology* if it is always true, and it is a *contradiction* if it is always false. Label the following as a tautology, a contradiction, or neither. Justify each answer using a truth table.

(a) $A \vee \neg A$

(b) $B \rightarrow (\neg A \wedge B)$

(c) $(\neg A \wedge B) \rightarrow B$

(d) $((A \rightarrow B) \wedge (B \rightarrow C)) \rightarrow (A \rightarrow C)$

(e) $((A \rightarrow B) \wedge (B \rightarrow C)) \wedge \neg(A \rightarrow C)$