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 \textit{not} my instructor.

Write each sentence below as a compound proposition using \( \{p, q, r, s\} \) and the logical connectives \( \{\lor, \land, \neg, \rightarrow, \leftrightarrow\} \). 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 \textit{is} my instructor and robot monkeys \textit{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 \textit{tautology} if it is always true, and it is a \textit{contradiction} if it is always false. Label the following as a tautology, a contradiction, or neither. Justify each answer using a truth table.

(a) \( A \lor \neg A \)

(b) \( B \rightarrow (\neg A \land B) \)

(c) \( (\neg A \land B) \rightarrow B \)
(d) \((A \rightarrow B) \land (B \rightarrow C)\) \rightarrow (A \rightarrow C)\\

(e) \((A \rightarrow B) \land (B \rightarrow C)) \land \neg(A \rightarrow C)\)