Problem 1.

Write the negation of the following propositions.

(a) He is at least 18 years old. (3 points)
(b) The summer in Maine is hot and sunny. (3 points)
(c) Zach blocks emails and texts from Mary. (3 points)

Problem 2.

Let \( p \) and \( q \) be the propositions “The election is decided”, and “The votes have been counted”, respectively. Express each of the compound propositions as an English sentence.

(a) \( \neg p \) (3 points)
(b) \( p \land q \) (3 points)
(c) \( \neg p \land q \) (3 points)
(d) \( q \rightarrow p \) (3 points)
(e) \( \neg q \rightarrow \neg p \) (6 points)
(f) \( p \iff q \) (3 points)
(g) \( \neg q \land (\neg p \land q) \) (6 points)

Problem 3.

Let \( p, q, r \) be the following propositions, as “\( p \): you get an A on the final exam”, “\( q \): you do every exercise in this book”, and “\( r \): you get an A in this class”. Write these propositions using \( p, q, \) and \( r \) and logical connectives.

(a) You get an A in this class, but you do not do every exercise in the book (3 points)
(b) You get an A on the final, you do every exercise in the book, and you get an A in the class (3 points)
(c) To get an A in this class, t is necessary for you to get an A in the final (3 points)
(d) You get an A on the final, but you do not do every exercise in the book; nevertheless, you get an A in the class (5 points)
(e) Getting an A on the final and doing every exercise in this book is sufficient for getting an A in the class (5 points)
(f) You will get an A in the class if and only if you either do every exercise in the book or you get an A on the final (5 points)
Problem 4

Construct a truth table for the following compound propositions

(a) $p \rightarrow \neg q$ (5 points)
(b) $\neg p \iff q$ (5 points)
(c) $(p \rightarrow q) \lor (\neg p \rightarrow q)$ (10 points)
(d) $((p \rightarrow q) \rightarrow r) \rightarrow s$ (20 points)