

You must work alone on your homework, and homework must be written legibly, single-sided on your own lined paper, or typed, with the answers clearly labeled and in the sequential order as assigned. You must write your name and university ID number in the upper right-hand corner of your homework. Staple all pages together and be sure that your name appears on every sheet.

- (5 points) Write your name clearly on each page. Write the time and place of the first midterm.
- (20 points) Simplify the following statements; show and give the justification for each step.
 - $\sim [(b \wedge a) \rightarrow (\sim a \vee \sim b)]$
 - $[(d \wedge (e \vee f)) \wedge \sim [d \vee \sim e)]$
- (20 points) Write the complete truth table for the following:
 - $(p \wedge \sim q) \rightarrow (p \wedge \sim r)$
 - $[x \leftrightarrow (y \wedge z)] \wedge (\sim x \vee z)$
- (30 points) Use the equivalence rules (1.1.1) and the rules of inference (1.3.1) in the textbook to prove each of the following or state that it is an invalid argument because you do not believe it can be proven:

(a)

P1	$p \vee s$
P2	$\sim (\sim q \vee r)$
P3	$(p \wedge q) \rightarrow r$
\therefore	$\sim r \wedge s$

(b)

P1	$\sim (e \vee f)$
P2	$a \vee c$
P3	$c \rightarrow d$
P4	$d \rightarrow f$
\therefore	a

(c)

P1	$p \rightarrow q$
P3	$x \rightarrow z$
\therefore	$(p \wedge x) \rightarrow (q \wedge z)$

5. (25 points) An alarm system has three different control panels in three different locations. To enable the system, switches in at least two of the panels must be in the on position. If fewer than two are in the on position, the system is disabled. Design a circuit to control the switches.
- (a) (10 points) Write out the complete truth table AND/OR a Boolean formula for this circuit. Assume the three switches are labeled x , y , z .
- (b) (15 points) Draw the circuit representing the above formula.
6. (No points will be awarded for this assignment unless this is done) Sign your name to the following honor code statement: "I pledge on my honor that I have not given or received any unauthorized assistance on this assignment".