

1. Three propositional variables  $p$ ,  $q$ , and  $r$  are defined as follows:

- $p$ : The printer is working.
- $q$ : The printer has a paper jam.
- $r$ : The printer has run out of ink.

Give a logical expression that is equivalent to each sentence below using the propositional variables. Any use of the word "or" is the inclusive or.

(a) The printer is working even though it has run out of ink.

(b) The printer is not working only if it has a paper jam.

(c) The printer is not working if it has run out ink or has a paper jam.

2. Fill in the following truth table below. It is broken in two to fit on the page. The empty column is for your own use if you want it.

$p$	$q$	$r$		$(r \vee \neg q) \rightarrow p$
T	T	T		
T	T	F		
T	F	T		
T	F	F		

$p$	$q$	$r$		$(r \vee \neg q) \rightarrow p$
F	T	T		
F	T	F		
F	F	T		
F	F	F		

3. Give the converse of the statement: "If 5 is prime then 4 is even".

4. For each statement below, indicate whether it is true or false:

- (a) If 6 is a prime number, then 4 is an even number.
- (b) If 4 is an even number, then 5 is a prime number.
- (c) 5 is an even number if and only if 5 is a prime number.
- (d) If 5 is a prime number, then 6 is a prime number.