

**Instructions:** Show all work. Use exact answers unless specifically asked to round. Be sure to complete all parts of each problem.

- Write each statement as the form "if  $p$ , then  $q$ ".
  - Legs of three and four imply a hypotenuse of five.

$$p \rightarrow q$$

- No irrational numbers are rational.

$$\sim p \rightarrow q$$

- The grass will be greener when we are on the other side.

$$q \rightarrow p$$

$p$  = There are legs of 3 & 4  
 $q$  = There is a hypotenuse of 5

$p$  = it is an irrational #  
 $q$  = it is a rational #

$p$  = the grass will be greener  
 $q$  = we are on the other side

- Write the converse of "If the Kings go to the playoffs, then pigs will fly".

$p$

$q$

converse  
 $q \rightarrow p$

if pigs fly, then the Kings go to the playoffs.

- Use either a truth table or an Euler diagram to determine the validity of the following argument.

If Dr. Hardy is a department chairman, then he lives in Atlanta.

He lives in Atlanta and his first name is Larry.

Therefore, if his first name is Larry, then he is not a department chairman.

$$p \rightarrow q$$

$$q \wedge h$$

$$h \rightarrow \sim p$$

$p$  = Dr. Hardy (he) is a department chairman.

$q$  = he lives in Atlanta

$h$  = his first name is Larry

$p$	$q$	$h$	$p \rightarrow q$	$q \wedge h$	$(p \rightarrow q) \wedge (q \wedge h)$	$\sim p$	$h \rightarrow \sim p$
T	T	T	T	T	T	F	F
T	T	F	T	F	F	F	T
T	F	T	F	F	F	F	F
T	F	F	F	F	F	F	T
F	T	T	T	T	F	T	T
F	T	F	T	F	F	T	T
F	F	T	T	F	F	T	T
F	F	F	T	F	F	T	T