Reading Questions 1

page 7 : What May I Assume?

1. The product of nonzero real numbers is nonzero. T

2. You must prove the previous statement if you want to use it in a proof. F

3. All real numbers are irrational. F

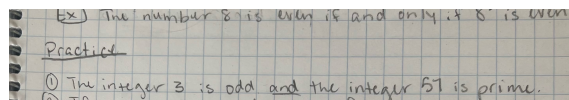4. List 3 prime numbers which are greater than 5. 7, 11, 1

Section 0.1 Compound Statements (Part 1)

Mathematical Statements

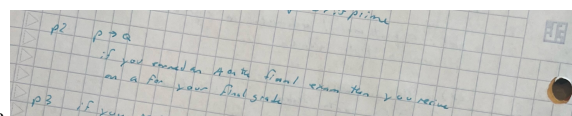**P 1.** Use the two following statements to create one compound statement.

$$P : \text{The integer 3 is odd.}$$

$$Q : \text{The integer 57 is prime.}$$

P 2. Use the next two statements to make one implication.

$$P : \text{You earned an A on the final exam.}$$

$$Q : \text{You received an A for your final grade.}$$

We will determine the truth value of an implication in the next section.

P 3. Sometimes the converse of an implication is easier to prove than the actual implication. Write the converse of the implication from the previous problem.

P 4. Use the following two statements to create a double implica

$$P : \text{The integer } n \text{ is even.}$$

$$Q : \text{The integer } n \text{ can be written as } 2k+1 \text{ for some integer } k.$$
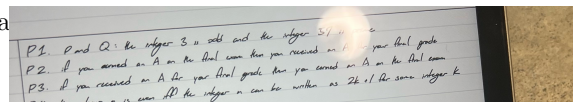
Truth Values

P 5. The truth value of a statement in an implication may be determined by the truth value of the implication. Given that p and $p \to q$ are true, determine the truth value of q. T

P 6. Given that $\neg p$ and $p \vee q$ are true, determine the truth value of q.

1
T

Def: A mathematical statement is an English statement that has a truth value.

Ex: P: The number 3 is odd.

P is a math statement which is true.

Q: Let x be an integer,

Q is not a math statement.

Def: A compound statement is statement constructed from 2 statements joined by the word "and" or "or".

Ex: P: The number 7 is greater than 3

Q: The number 8 is even

P and Q: The number 7 is greater than 3 and the number 8 is even.

P or Q: " or "

Def: The statement "P implies Q" is an implication where P is the hypothesis and Q is the conclusion.

$P \rightarrow Q$, $P \Rightarrow Q$, If P then Q.

Ex: R: If 8 is greater than 0 then 8^2 is greater than 0.

   hypothesis: P   conclusion Q

   R: $P \to Q$

Def: The converse of the implication $P \to Q$ is $Q \to P$.

Ex: Let R: If 8^2 is even, then 8 is even.

   Then the converse of R is

       If 8 is even then 8^2 is even.

Def: The statement $P \to Q$ and $Q \to P$ is a double
     implication.

            $P \leftrightarrow Q$ $P <=> Q$ P iff Q
                                    if and only if

Ex:

     The number 8 is even   if and only if 8^2 is even.

1.1

Def: Let P and Q be statements. A table listing the
     possible truth values of each statement is called
     a truth table.

   and : $\wedge$
   or : $\vee$

Ex: Let P and Q be statements. Use a truth table to list the possible value of $P \wedge Q$, $P \vee Q$.

P	Q	$P \wedge Q$	$P \vee Q$
T	T	T	T
F	T	F	T
T	F	F	T
F	F	F	F

Note: The negation of P, denoted by $\neg P$, has the opposite value of P.

Ex:

P	Q	$\neg P$	$P \vee Q$	$P \rightarrow Q$
T	T	F	T	T
F	T	T	T	T
T	F	F	T	F
F	F	T	F	T