

Assignment 1

For Discrete Mathematics

Q1. Each of the following statements is true. In each case write the converse of the statement, and give a counterexample showing that the converse is false.

- a) If n is any prime number that is greater than 2, then $n+1$ is even.
- b) If m is any odd integer, then $2m$ is even.
- c) If two circles intersect in exactly two points, then they do not have a common center.

Q2. Use rules of inference to show that the hypotheses "If a person is a teenager, then they must be enrolled in high school," "If a person is enrolled in high school, they will have homework assignments," and "John has homework assignments" imply the conclusion "John is a teenager."

Q3. Prove that,

- a) For all integers m and n , if $m+n$ is even then m and n are both even or m and n are both odd.
- b) Use proof by contradiction to show that every integer greater than 11 is a sum of two composite numbers.
- c) Prove by contradiction that $1 + 3\sqrt{2}$ is irrational.
- d) Use proof by contradiction to show that for every integer n , $3n+2$ is not divisible by 3.

Q4. Rewrite the statements in each pair in if-then form and indicate the logical relationship between them.

- a) All the children in Tom's family are female. All the females in Tom's family are children.
- b) All the integers that are greater than 5 and end in 1, 3, 7, or 9 are prime.
- c) All the integers that are greater than 5 and are prime end in 1, 3, 7, or 9.