MATH120
Discrete Mathematics

Assignment 2 **Due 5pm on Friday 5 August 2022**

1. Consider the argument

$$\big((p \vee q) \wedge (p \to r)\big) \to (q \vee \neg r).$$

   (a) Determine whether it is a valid argument by means of a truth table. Which rows of the table are crucial for assessing the validity of the argument and which rows can be ignored?

   (b) Is the statement a logical implication? In other words, does

$$\big((p \vee q) \wedge (p \to r)\big) \to (q \vee \neg r)?$$

   Why/why not?

2. For each of the following statements, either prove that the statement is true or give a counterexample that disproves it.

   (a) If n is an odd integer then $-5n$ is odd.

   (b) For all positive integers n, $2n^2 + n = n^3 + 2$.

   (c) The sum of three consecutive integers is divisible by 3.

3. (a) Write the inverse and contrapositive of the statement $(p \wedge q) \to r$.

   (b) Use the method of proof by contrapositive to prove that for all integers n if $n^2 + 1$ is even, n is odd.

   (c) Can we prove that a statement of the form $p \to q$ is true by proving that its inverse is true? Why/why not?