MATH221 – Mathematics for Computer Science – Autumn 2018

Assignment One – Due in Week Six Tutorial

*Student Name:*_____ *Student Number:*_____

*Tutorial Day & Time:*_____

Untidy or badly set out work will not be marked, and will be recorded as unsatisfactory.
This assignment should be submitted to your tutor in your Week 6 tutorial.

Question 1. [2 Marks] Consider your student number, n to be a natural number. Find natural numbers q, r with $0 \leq r < 3$ such that $n = 3q + r$.

Question 2. [2 Marks] Using the value of r computed in Question 1 above answer **only** part (r) of this question:

(0) Let P, Q be statements. Write down a compound statement that is true when one and only one of P or Q is false. Justify your answer using a truth table.

(1) Is $\sim Q \Rightarrow P \vee (P \wedge \sim Q)$ a tautology, a contradiction or a contingent statement? Justify your answer.

(2) Prove, using cases, that for every natural number $n \geq 1$ the expression $n^2 + n + 4$ is not a prime number.

Question 3. [2 Marks] Use a truth table to show that the following is a valid argument.

$$P \Rightarrow Q$$
$$\sim P$$
$$\therefore \sim Q.$$

Question 4. [4 Marks] In this induction question, full marks will only be awarded for writing out a *full* argument, like those in the examples from lectures. That is, make it clear which step you're doing, and write out what Claim k and Claim $k + 1$ are, then wrap up the argument with a concluding sentence ("Therefore, by induction, ...").

Prove by mathematical induction that $1^2 + 3^2 + 5^2 + \cdots + (2n-1)^2 = \frac{4n^3 - n}{3}$ for all $n \in \mathbb{N}$.

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Submission Receipt for Tutorial Submission

*Student Name:*_____ *Student Number:*_____

*Date Submitted:*_____ *Tutor Initials:*_____