Foundations of Computer Science (COMP109)

Tutorial III, Week 16.10.2023 – 20.10.2023

A reasonable attempt at answering Question (III.2.) should be submitted on Canvas by ***23:59 on Tuesday 17.10.2023*** *either as a text entry, a text file (txt), a pdf file, or a photo of the handwritten answer. This assignment makes up 1% of your final mark. We would like to encourage you to discuss the questions with your fellow students in person or on the Canvas discussion board, but do not copy your answer from anybody else.*

III.1. Use proof by contradiction to show that if p is rational and r is irrational then $p + r$ is irrational.
Hint: Use the fact that the difference of two rational numbers is rational.

III.2. Prove or disprove that for any irrational numbers r and s their product rs is also irrational.

III.3. Determine which statements in III.3.a–III.3.e are true and which are false. Prove those that are true and disprove those that are false.

(a) $6 - 7\sqrt{2}$ is irrational.

(b) $3\sqrt{2} - 7$ is rational.

(c) $\sqrt{4}$ is irrational.

(d) The sum of any two irrational numbers is irrational.

(e) If r is a positive irrational number then $\sqrt{r}$ is irrational.