Discrete Mathematics and Probability **Proof**
Session 2023/24, Semester 1 Week 2 Homework 1

This homework runs from 3pm Thursday 21 September 2023 until 12 noon on Thursday 28 September 2023. Submission is to Gradescope Homework 1.

Question 1

(a) Suppose $n \in \mathbb{Z}$ is an integer. Write down the contrapositive of the following statement.

$$\text{If } 7n - 2 \text{ is even then } n \text{ is even.}$$

[2 marks]

(b) Use proof by contraposition to prove the statement in part (a). *[4 marks]*

Question 2

If r and s are real numbers then their *geometric mean* is $\sqrt{rs}$, the square root of their product.

Suppose that r and s are non-zero real numbers with geometric mean g where g is rational. Prove that r is rational if and only if s is rational.

$$r \text{ is rational} \quad \Longleftrightarrow \quad s \text{ is rational}$$

[4 marks]