Discrete Mathematics and Probability **Proof**
Session 2026/27, Semester 1 Week 2 Homework 1

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This homework runs from Thursday 24 September 2026 until 12 noon on Thursday 1 October 2026. Submission is to Gradescope Homework 1.

Questions marked with an asterisk $*$ may be a little harder than others. All are still within the course curriculum, though, and can be done using the methods taught in the study guides and textbook.

You should aim to write out solutions that someone who does not already know the answer could follow and understand.

Question 1

(a) Write down the negation of the following statement.

$$\text{For all integers } n, \text{ if } n \text{ is prime then } (n^2 - 2) \text{ is prime}$$

[*2 marks*]

(b) Use a counterexample to prove the statement in part (a) is false. [*2 marks*]

Question 2

Prove by contraposition that for any irrational number r its cube root $\sqrt[3]{r}$ is also irrational. [*4 marks*]

$*$ Question 3

Write out a proof that if a and b are integers then not all of a, $(a+b)$, and ab are odd. [*2 marks*]