



COS 210 Worksheet 1

- This worksheet consists of **3 questions** for a total of **11 marks**.
- Show your working for all calculations and reasoning.

Question 1 (5 marks)

Prove the following statement by contradiction:

If p is a prime number, then \sqrt{p} is irrational.

Question 2 (3 marks)

Prove by induction that for all natural numbers $n \geq 1$,

$$1^3 + 2^3 + 3^3 + \dots + n^3 = \left(\frac{(n) \cdot (n+1)}{2} \right)^2$$

Question 3 (3 marks)

Prove by induction that for all natural numbers $n \geq 1$,

$11^{n+2} + 12^{2n+1}$ is divisible by 133