

Mathematics for Science

Assignment 13

Introduction to Mathematical Induction

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Instructions: Attempt all the Questions

- 1) Prove that for all positive integers n then;
 - a) $a + ar + ar^2 + \dots + ar^{n-1} = \frac{a(r^n - 1)}{r - 1}, r \neq 1$
 - b) $1 + x + x^2 + \dots + x^{n-1} = \frac{1 - x^n}{1 - x}, x \neq 1$
 - c) $1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$
 - d) $2^0 + 2 + 2^3 + 2^4 + \dots + 2^{n-1} = 2^n - 1$
 - e) $1 + \frac{1}{2^2} + \frac{1}{3^2} + \dots + \frac{1}{n^2} = \frac{2n+1}{n+2}$
 - f) $1 \cdot 2 + 2 \cdot 3 + 3 \cdot 4 + \dots + n(n+1) = \frac{n}{3}(n+1)(n+2)$
- 2) Prove that $n^3 - n$ is divisible by 6.
- 3) Prove that $n(n+1)(n+2)$ is divisible by 6.
- 4) Prove that $8^n + 6$ is divisible by 14.