NIRMA UNIVERSITY
Institute Of Technology, Ahmedabad
B.Tech. 3rd CE/IT (ODD 2020-21)
2CS305: Discrete Mathematics
Tutorial
Topic-Proof Techniques

1) Prove that n2 + 1 ≥ 2^n when n is a positive integer with 1 ≤ n ≤ 4.

2) Prove that if n is a perfect square, then n + 2 is not a perfect square.

3) Prove that $\sqrt{2}$ is irrational by giving a proof by contradiction.

4) Prove that $m^2 = n^2$ if and only if m = n or m = −n.

5) Prove that the sum of two rational numbers is rational

6) Show that if 3m+2 is odd then m is odd.

7) Show that for any integer n,

$$(11)^{n+2} + (12)^{2n+1}$$

is divisible by 133.

8)) Show that $n^3 + 2n$ s divisible by 3 for all n>=1 by induction

9) Prove by induction that for $n \geq 1$

$$1 \cdot 1! + 2 \cdot 2! + \cdots \ldots \ldots \ldots \ldots \ldots + n \cdot n! = (n+1)! - 1$$

10)Show that

$$1^2 + 3^2 + 5^2 + \cdots \ldots \ldots \ldots + (2n-1)^2 = \frac{n(2n-1)(2n+1)}{3}$$

11) Show that at least two of any eight days must fall on the same day of the week.

12) Prove by induction that the sum of the cubes of the three consecutive integers is divisible by 9.