

Mathematical Induction and Proof of Recursion

10/10/2020

Prove Algebra 2 Induction Section (MATH 201)

PROVE SECTION 1.1.1, 1.1.2, 1.1.3, 1.1.4

Section 1.1.1

- $$\frac{(n+1)! - n! + (n-1)! - \dots + (-1)^{n+1} 1! + (-1)^n 0!}{(n+1)! - n!} = \frac{1}{n+1}$$
- $$\frac{(n+1)! - n! + (n-1)! - \dots + (-1)^{n+1} 1! + (-1)^n 0!}{(n+1)! - n!} = \frac{1}{n+1}$$
- $$\frac{(n+1)! - n! + (n-1)! - \dots + (-1)^{n+1} 1! + (-1)^n 0!}{(n+1)! - n!} = \frac{1}{n+1}$$
- $$\frac{(n+1)! - n! + (n-1)! - \dots + (-1)^{n+1} 1! + (-1)^n 0!}{(n+1)! - n!} = \frac{1}{n+1}$$

Section 1.1.2

- $$(n^2 - 1)^2 - (n^2 - 2n + 1)^2 = (n-1)^2$$
- $$(n^2 - 1)^2 - (n^2 - 2n + 1)^2 = (n-1)^2$$

Section 1.1.3

- $$1^2 + 3^2 + \dots + (2n-1)^2 = \frac{1}{3}n(2n-1)(2n+1)$$
- $$1^2 + 3^2 + \dots + (2n-1)^2 = \frac{1}{3}n(2n-1)(2n+1)$$

Section 1.1.4

- Prove by induction that $1^2 + 2^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}$

n	1	2	3	4	5
$1^2 + 2^2 + \dots + n^2$	1	5	14	30	55
$\frac{n(n+1)(2n+1)}{6}$	1	5	14	30	55
- Prove by induction that $1^3 + 2^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$

n	1	2	3	4	5
$1^3 + 2^3 + \dots + n^3$	1	9	36	100	225
$\frac{n^2(n+1)^2}{4}$	1	9	36	100	225