

Mathematical Induction and Proof of Recursion

10/10/2020

Prove Algebra 2 Induction Section (MATH201)

PROVE SECTION 1.1.1, 1.1.2, 1.1.3, 1.1.4

Section 1.1.1

1. $\sum_{k=1}^n (2k-1) = n^2$

$$\frac{(2n-1) + (2n-3) + \dots + 1}{n} = \frac{(2n-1) + 1}{2} \cdot n = n^2$$
2. $\sum_{k=1}^n k^2 = \frac{n(n+1)(2n+1)}{6}$

$$\frac{1^2 + 2^2 + \dots + n^2}{n} = \frac{1 + 4 + \dots + n^2}{n} = \frac{n(n+1)(2n+1)}{6n}$$
3. $\sum_{k=1}^n k^3 = \frac{n^2(n+1)^2}{4}$

$$\frac{1^3 + 2^3 + \dots + n^3}{n} = \frac{1 + 8 + \dots + n^3}{n} = \frac{n^2(n+1)^2}{4n}$$
4. $\sum_{k=1}^n k^4 = \frac{n(n+1)(2n+1)(3n^2+3n-1)}{30}$

$$\frac{1^4 + 2^4 + \dots + n^4}{n} = \frac{1 + 16 + \dots + n^4}{n} = \frac{n(n+1)(2n+1)(3n^2+3n-1)}{30n}$$

Section 1.1.2

1. Prove using induction: $(x^2 - 1)^n = (x-1)^n (x+1)^n$

$$x^2 - 1 = (x-1)(x+1)$$
2. Prove using long division: $(x^2 - 1)^n = (x-1)^n (x+1)^n$

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

Section 1.1.3

1. Prove by induction: $(x^2 - 1)^n = (x-1)^n (x+1)^n$

$$x^2 - 1 = (x-1)(x+1)$$
2. Prove by induction: $(x^2 - 1)^n = (x-1)^n (x+1)^n$

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

Section 1.1.4

1. Prove by induction: $(x^2 - 1)^n = (x-1)^n (x+1)^n$

$$x^2 - 1 = (x-1)(x+1)$$
2. Prove by induction: $(x^2 - 1)^n = (x-1)^n (x+1)^n$

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