

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

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

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

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

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

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

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 1.3

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

Section 1.4

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

n	Left Side	Right Side
1	$x^2 - 1$	$(x-1)(x+1)$
2	$(x^2 - 1)^2$	$(x-1)^2(x+1)^2$
3	$(x^2 - 1)^3$	$(x-1)^3(x+1)^3$
4	$(x^2 - 1)^4$	$(x-1)^4(x+1)^4$
5	$(x^2 - 1)^5$	$(x-1)^5(x+1)^5$

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

n	Left Side	Right Side
1	$x^2 - 1$	$(x-1)(x+1)$
2	$(x^2 - 1)^2$	$(x-1)^2(x+1)^2$
3	$(x^2 - 1)^3$	$(x-1)^3(x+1)^3$
4	$(x^2 - 1)^4$	$(x-1)^4(x+1)^4$
5	$(x^2 - 1)^5$	$(x-1)^5(x+1)^5$

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

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