

Mathematical Induction and Proof of Recursion

10/10/2023

Prove Algebra 2 Math Exam Review (MATH202)

PROVE BY INDUCTION 1.1, 1.2, 1.3, 1.4, 1.5, 1.6

Problem 1.1.1

1. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$
 $(1+2+\dots+n)^2 = \frac{n(n+1)}{2} \cdot \frac{n(n+1)}{2} = \frac{n^2(n+1)^2}{4}$
 $1^3 + 2^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$
2. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$
 $(1+2+\dots+n)^2 = \frac{n(n+1)}{2} \cdot \frac{n(n+1)}{2} = \frac{n^2(n+1)^2}{4}$
 $1^3 + 2^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$
3. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$
 $(1+2+\dots+n)^2 = \frac{n(n+1)}{2} \cdot \frac{n(n+1)}{2} = \frac{n^2(n+1)^2}{4}$
 $1^3 + 2^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$
4. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$
 $(1+2+\dots+n)^2 = \frac{n(n+1)}{2} \cdot \frac{n(n+1)}{2} = \frac{n^2(n+1)^2}{4}$
 $1^3 + 2^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$
5. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$
 $(1+2+\dots+n)^2 = \frac{n(n+1)}{2} \cdot \frac{n(n+1)}{2} = \frac{n^2(n+1)^2}{4}$
 $1^3 + 2^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$

Problem 1.2

1. Prove using induction: $(x^n - 1)^2 = (x - 1)^2 (x^{n-1} + x^{n-2} + \dots + 1)^2$
 $(x^n - 1)^2 = (x - 1)^2 (x^{n-1} + x^{n-2} + \dots + 1)^2$
2. Prove using long division: $(x^n - 1)^2 = (x - 1)^2 (x^{n-1} + x^{n-2} + \dots + 1)^2$
 $(x^n - 1)^2 = (x - 1)^2 (x^{n-1} + x^{n-2} + \dots + 1)^2$

Problem 1.3

1. Prove by induction: $(x^n - 1)^2 = (x - 1)^2 (x^{n-1} + x^{n-2} + \dots + 1)^2$
 $(x^n - 1)^2 = (x - 1)^2 (x^{n-1} + x^{n-2} + \dots + 1)^2$
2. Prove by induction: $(x^n - 1)^2 = (x - 1)^2 (x^{n-1} + x^{n-2} + \dots + 1)^2$
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Problem 1.4

1.1.1. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$
 1.2. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$
 1.3. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$
 1.4. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$
 1.5. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$
 1.6. $(1+2+\dots+n)^2 = 1^3 + 2^3 + \dots + n^3$ $\forall n \in \mathbb{N}$

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