

Problem Set 4 Foundations Due 2/22/2005

Each problem is worth 5 points. Clear and complete justification is required for full credit. You are welcome to discuss these problems with anyone and everyone, but must write up your own final submission without reference to any sources other than the textbook and instructor.

1. Consider the formula $2 + 5 + 8 + \dots + (3n - 1) = \frac{n(3n + 1)}{2}$.

- a) Write the formula in sigma notation.
- b) Use mathematical induction to prove the formula.

2. Consider the formula $1 + 4 + 9 + \dots + n^2 = \frac{n(n + 1)(2n + 1)}{6}$.

- a) Write the formula in sigma notation.
- b) Use mathematical induction to prove the formula.

3. Think about the derivatives of $f(x) = e^{ax}$.

- a) Write a formula for the n^{th} derivative of $f(x)$.
- b) Use mathematical induction to prove the formula.

4. Use mathematical induction to prove that $5^n - 1$ is divisible by 4 for any natural number n .

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