EE5801 Assignment 2

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1 Homework list

- Tutorial 3
- Tutorial 4

2 Solution

2.1 Tutorial 3

1 We give a proof by induction. Let $S(n) = 1 + 5 + 9 + ... + (4n - 3)$, where n is a positive integer. We want to prove that for every n, $S(n) = 2n^2 - n$.

Basis step: $S(1) = 2 \times 1^2 - 1 = 1$, which is same with sum of 1.

Inductive step: Assume $S(k) = 2k^2 - k$. We want to show $S(k + 1) = 2(k + 1)^2 - k$.

$$S(k + 1) = 1 + 5 + 9 + ... + (4k - 3) + (4(k + 1) - 3) = S(k) + 4(k + 1) - 3$$

$$S(k + 1) = 2k^2 - k + 4(k + 1) - 3 = 2k^2 + 4k + 2 - 1 - k$$

$$2k^2 + 4k + 2 - 1 - k = 2(k^2 + 2k + 1) - 1 - k = 2(k + 1)^2 - (k + 1)$$

So, we have shown that if $S(k) = 2k^2 - k$, then $S(k + 1) = 2(k + 1)^2 - k$. Since the statement is also true for the basis case, $S(n) = 2n^2 - n$ for every positive integer n.