# CMPE471 – Tutorial 1

Q1. Using the principle of mathematical induction, prove that:

a: $\sum\_{i=1}^{n}i^{3}= (\sum\_{i=1}^{n}i)^{2}$

|  |
| --- |
| Answer:  |

b: $1+2^{n}< 3^{n}, for all n\geq 2, n \in N$

|  |
| --- |
| Answer: $$RHS$$ |

Q2. Prove that, if $\left(1+x\right)>0$ then, $\left(1+x\right)^{n}\geq 1+nx, for all n \in N$

|  |
| --- |
| Answer:  |

Q3. Let ∑ be an alphabet. Prove that the relation:

R = { (*x,y*) | *x* is a prefix of *y* } is a partial ordering relation of ∑\*

|  |
| --- |
| Answer:  |

Q4. Let ∑ = {a,b}, in each of the following three cases, give an example of languages L1 and L2 that satisfy the stated conditions. (Note that L1⊆∑\*, and L2⊆∑\*).

* 1. L1L2 = L2L1, such that L1 ⊆ L2, L2 ⊄ L1, and L1 ≠{ε}
	2. (L1∪L2)\* ≠ L1\* ∪ L2\*
	3. (L1∪L2)\* = L1\* ∪ L2\*, such that L1 ⊄ L2, and L2 ⊄ L1

|  |
| --- |
| Answer:  |

Q6. If *r* is a real number not equal to 1, prove the following formula:

 (1 – *r n*+1) / (1- *r*) for *n* ≥ 0

|  |
| --- |
| Answer: |