

## Homework 1

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2021/04/01  
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1. [20 points ] Use mathematical induction to prove:

For any natural number  $n$ ,  $n^3 - n$  is divisible by 3

2. [40 points ] Write algorithm of calculating Factorial by following the requirements:

- Write the algorithm using loop.
- Explain what "loop invariant" is and prove the algorithm is correct
- Calculate the running time of this algorithm (you can assume any constant)
- Write algorithm using recursion

3. [40 points] Solve the "Maximum Ascending Subarray Sum" problem (no, 1800) on [leetcode.com](https://leetcode.com), then follow the following requirements:

- Make a successful submission. Attach the screen shot image of your submission.

Note. your submission image should be something like this  
(that is, pass all test cases, instead of an accept page of a particular test case)

The screenshot shows a 'Success' message with details for a submission. It includes runtime and memory usage statistics, a list of next challenges, and a table of test case results.




Success Details >

Runtime: 52 ms, faster than 57.69% of Ruby online submissions for Maximum Ascending Subarray Sum.

Memory Usage: 209.9 MB, less than 23.08% of Ruby online submissions for Maximum Ascending Subarray Sum.

Next challenges:

- Container With Most Water
- Minimum Operations to Reduce X to Zero
- Minimum Length of String After Deleting Similar Ends

Show off your acceptance:   

Time Submitted	Status	Runtime	Memory	Language
04/01/2021 15:59	Accepted	52 ms	209.9 MB	ruby

- Calculate the running time of your algorithm as a function of your input size.  
(Do not just give the result, show how you calculate the result)

