Additional problems and exercices

No credit, No due date

You are encouraged to work on the following exercises

If you have any questions ask the instructor during office hours

Exercise 0.

Do the Exercides of the textbook for the chapters/sections covered in class. The more you do of them the more you practice.

Exercise 1.

Calculate the following sum for any $x \neq 1$

$$x + 2x^2 + 3x^3 + \ldots + nx^n = \sum_{i=1}^{n} ix^i.$$

(*Hint:* Consult the appendix (Appendix A) on page 1060.

Exercise 2.

Show that

$$\sum_{i=1}^{n} i^2 = \Theta(n^3).$$

What are the values of c_1, c_2 and n_0? Justify your answer.

Exercise 3.

TRUE or FALSE?

1. $\lg(n!) = O(n^2)$.
2. $n + \sqrt{n} = O(n^2)$.
3. $n^2 + \sqrt{n} = O(n^2)$.
4. $n^3 + 2\sqrt{n} = O(n^2)$.
5. $1/n^3 = O(\lg n)$.
6. $n^2\ sin^2(n) = \Theta(n^2)$. ($sin$ is the well-known trigonometric function).

Exercise 4.

Prove the following.

1. $(n-10)^2 = \Theta(n^2)$.
2. $n^4 + 10n^3 + 100n^2 + 1890n + 98000 = \Omega(n^4)$.
3. $n^4 + 10n^3 + 100n^2 + 1890n + 98000 = \Omega(n^2)$.
4. $n^4 - 10n^3 - 100n^2 - 1890n + 100000 = O(n^4)$.
5. $n^2 - 20n - 20 = \Omega(n)$.
6. $n^2 + 20n = O(n^2)$.