

Second Assignment

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Task 1

Prove that $O(n^2) = an^2 + bn - c$, where a - is first 2 digits of your student code, b - is 3rd and 4th digit of your student code, c - last two digits of your student code.

Code 201752IVSB, then $a = 20$, $b = 17$, $c = 52$,
equation is $O(n^2) = 20n^2 + 17n - 52$

From theory we know that $f(n) \leq c \cdot g(n)$, so we get:

$$20n^2 + 17n - 52 \leq c \cdot n^2$$

To simplify our equation we can choose that $c = 21$. Now let's solve this:

$$\begin{aligned} 20n^2 + 17n - 52 &\leq 21n^2 \\ 20n^2 - 21n^2 + 17n - 52 &\leq 0 \\ -n^2 + 17n - 52 &\leq 0 \quad | \cdot -1 \\ n^2 - 17n + 52 &\geq 0 \end{aligned}$$

By taking the derivative of the quadratic formula we get:

$$\begin{aligned} 2n - 17 &\geq 0 \\ 2n &\geq 17 \\ n &= 8.5 \end{aligned}$$

Meaning that the function starts to grow again after the value 8.5 is encountered.

By solving this quadratic formula equation we get the following values:

$$n_1 = 13, n_2 = 4, \text{ so } n < 4 \vee n > 13$$

Meaning that the function is positive only when bigger than 4 or 13.

As a result we get — $c = 21, n = 14$