Question 3:

$$T_A = 7T_A\left(\frac{n}{2}\right) + n^2 \; ; \; T_B(n) = \alpha T_B\left(\frac{n}{4}\right) + n^2$$

first we sölve the time complerity of $T_A(n)$.

$a = 7$, $b = 2$, $K = \log_2 7 \simeq 2.81$, $f(n) = n^2$.

we can apply the first case of master's thm.

for $\varepsilon \simeq 0.81 > 0$; $f(n)$ is $O(n^{\log_2 7 - \varepsilon}) = O(n^2)$.

$\Longrightarrow T_A(n)$ is $\Theta(n^{\log_b a}) = \Theta(n^{2.81})$.

To find the largest α for T_B that is assymptically faster

we set the values equal to each other, we solve α

Then we deduct 1 from α.

$$K_A = \log_2 7 = \log_4 \alpha'$$

$$\Longrightarrow \alpha' = 49 \rightarrow \alpha = 49 - 1 = 48.$$

hence The algorithm B runs assymptotically faster than T_A for $\alpha \leq 48$.