Let $f(n) = 8k$ and let $n^2 > k$

$f(n) = O\left(n^{\log_2 16 - \varepsilon}\right)$ is true for $\varepsilon = 2 > 0$

choosing $n^2 > k \Rightarrow n^{4-\varepsilon} = n^2$ and $O(n^2) = f(n) = 8k$

since $n^2 > k \Rightarrow 8k \leq c \cdot k < cn^2 = O(n^2)$ where we choose sufficiently large c $(c \geq 8)$

$T(n) = 16T\left(\frac{n}{2}\right) + 8k = 16T\left(\frac{n}{2}\right) + f(n)$ for $n^2 > k$

and $f(n) = O\left(n^{\log_2 16 - \varepsilon}\right)$ with $\varepsilon = 2 > 0$

$f(n) = 8k \leq c \cdot k < c \cdot n^2 = O(n^2) = O\left(n^{\log_2 16 - \varepsilon}\right) = O(n^{4-2})$

so, by master's theorem for case 1,

$T(n) = \Theta\left(n^{\log_2 16}\right) = \Theta(n^4)$

$T(n) = \Theta(n^4)$ ✓

$T(n) = k$ for $n^2 \leq k$ is just smaller cases, we should not bother about it at all