1. (25%) What Asymtotic solution, if any, does the master method give for each of the following recurrences?

   (a) $T(n) = 16T(\frac{n}{2}) + 3n^4 \log^2(n) = \Theta(n^4 \log^2(n))$

   Proof. Let $a = 16$, $b = 2$, $f(n) = 3n^4 \log^2(n)$. Clearly,

   $$\log_2(16) = 4 \text{ and}$$
   $$f(n) = \Theta(n^4 \log_2^2(n)).$$

   Therefore, by the Master Method Theorem,

   $$T(n) = \Theta(n^4 \log_2^3(n)).$$

   □