a.

$$\lim_{n\to\infty}\frac{\log_7 n}{\log_{12} n}=\lim_{n\to\infty}\frac{\frac{\ln n}{\ln 7}}{\frac{\ln n}{\ln 12}}=\lim_{n\to\infty}\frac{\ln 12}{\ln 7}=\log_7 12$$

Since the limit is a positive constant, these two functions are “in the same category”.

b.

$$\lim_{n\to\infty}\frac{7^n}{12^n}=\lim_{n\to\infty}\left(\frac{7}{12}\right)^n=0$$

Since the limit is 0, the function in the denominator is in a strictly “worse” category.

c.

$$\lim_{n\to\infty}\frac{n^{10000000}}{1.00001^n}=\lim_{n\to\infty}\frac{100000000n^{99999999}}{1.00001^n*\ \ln 1.00001}=\cdots(Keep\ applying\ L'Hospital's\ \ldots)$$
$$=\lim_{n\to\infty}\frac{0}{1.00001^n*k}=0$$

Since the limit is 0, the function in the denominator is in a strictly “worse” category.