7. [10 points] Consider the two sequences a_n and b_n defined by

$$a_n = \frac{1}{2^n} \qquad\qquad b_0 = 5, \quad b_n = 3b_{n-1} \text{ for all } n > 1.$$

Compute the following limits. If the sequence diverges, write DIVERGES.
No justification necessary.

a. [2 points] $\displaystyle\lim_{n\to\infty} a_n$

Answer: $\displaystyle\lim_{n\to\infty} a_n =$ _____

b. [2 points] $\displaystyle\lim_{n\to\infty} \sum_{k=0}^{n} a_k$

Answer: $\displaystyle\lim_{n\to\infty} \sum_{k=0}^{n} a_k =$ _____

c. [2 points] $\displaystyle\lim_{n\to\infty} a_n b_n$

Answer: $\displaystyle\lim_{n\to\infty} a_n b_n =$ _____

d. [2 points] $\displaystyle\lim_{n\to\infty} \frac{\ln(b_n)}{\ln(a_n)}$

Answer: $\displaystyle\lim_{n\to\infty} \frac{\ln(b_n)}{\ln(a_n)} =$ _____

e. [2 points] $\displaystyle\lim_{n\to\infty} \frac{1 - e^{3a_n}}{a_n}$

Answer: $\displaystyle\lim_{n\to\infty} \frac{1 - e^{3a_n}}{a_n} =$ _____