

3. [14 points] At a wildlife sanctuary in central Africa, conservationists are carefully monitoring the population of various species of animals. For the following parts, write your answers *in the spaces provided*. Your answers for this problem can either be exact, or accurate to three decimal places.
- a. [3 points] On January 1, 2008, the population of lions in the sanctuary was estimated to be 850, and was decreasing exponentially at a continuous rate of 25% each year. Find a formula for the population $L(t)$ of lions in the sanctuary t years after January 1, 2008. **You do not need to show any work for this part.**

$$L(t) = \underline{\hspace{10cm}}$$

- b. [5 points] On the other hand, the number of elephants in the sanctuary increased by 60% every 7 years. Let $E(t)$ be the number of elephants in the sanctuary t years after January 1, 2008. What is the (annual) continuous growth rate of the function E ? You should carefully **show your work** for this part.

The continuous growth rate of E is $\underline{\hspace{10cm}}$ per year.

For the following parts, **you do not need to show any work**, but **you can receive partial credit for work shown if your final answer is incorrect**.

- c. [3 points] Let $B(m) = 60(3)^{0.5m-1}$ be the number of buffalo in the sanctuary m months after July 15, 2016. What is the (monthly) continuous growth rate of the function B ?

The continuous growth rate of B is $\underline{\hspace{10cm}}$ per month.

- d. [3 points] Let $H(y)$ be the total value of donations received by the sanctuary's governing organization (in thousands of dollars) y years after July 15, 2016. The function H is exponential, with continuous growth rate $e^{0.77}$. What is the annual percentage growth rate of the function H ?

The annual percentage growth rate of H is $\underline{\hspace{10cm}}$