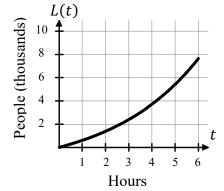# 1.1 Can change occur at an instant?

Calculus   Name: _____

1. The number of people who have left an amusement park is modeled by the function L, where $L(t)$ gives the number of people in thousands who have left the park and t gives the number of hours since 10:00 a.m. for $0 \le t \le 6$. The graph of the function L is shown to the right.
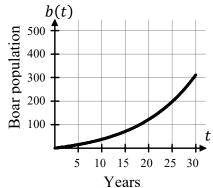
   $L(t)$

   People (thousands)

   Hours

   a. Draw a tangent line at $t = 1$.

   b. Give a rough estimate of the instantaneous rate of change at $t = 1$.

   c. Give an example of how to calculate a rate of change that would give a close estimate to the instantaneous rate of change at $t = 4$.

2. The population of a community of wild boar is modeled by the function b, where $b(t)$ gives the number of boar and t gives the number of years since 1990. for $0 \le t \le 30$. The graph of the function b is shown to the right.

   $b(t)$

   Boar population

   Years

   a. Draw a tangent line at $t = 25$.

   b. Give a rough estimate of the instantaneous rate of change at $t = 25$.

   c. Give an example of how to calculate a rate of change that would give a close estimate to the instantaneous rate of change at $t = 5$.

3. The number of people enlisting in the army each year can be modeled by E, where $E(t)$ is the number of new recruits and t is the year since 1980 for $0 \le t \le 20$.

   a. What does $E(7)$ represent?

   b. What does $\frac{E(7)-E(2)}{7-2}$ represent?

   c. What does $\frac{E(7)-E(6.999)}{7-6.999}$ represent?

4. The number of jobs created in the U.S. for the 2021 economy can be modeled by J, where $J(t)$ is number of new jobs and t is the month for $0 \le t \le 12$.

   a. What does $J(3)$ represent?

   b. What does $\frac{J(6)-J(2)}{6-2}$ represent?

   c. What does $\frac{J(10)-J(9.999)}{10-9.999}$ represent?

Answers to 1.1 CA #1

1a. check graph. 1b. ≈ 400 people per hour. 1c. $\dfrac{L(4)-L(3.999)}{4-3.999}$	2a. check graph. 2b. ≈ 20 boar per year. 2c. $\dfrac{b(5)-b(4.999)}{5-4.999}$

3a. The number of new recruits in 1987.	3b. The average rate of change in number of new recruits per year from 1982 to 1987.	3c. The rate of change of new recruits per year in 1987.
4a. The number of new jobs created in March.	4b. The average rate of change in number of new jobs created per month from February to June.	4c. The rate of new jobs created per month in October of 2021.