Lecture Activity: Derivatives in the Real World

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Each of the following scenarios describes a function f which models a real-world phenomenon. In each case, answer the following questions.

a. What are the units of the input and output of f?

b. What does f' mean? Describe it without using math words.

c. What are the units of f'?

d. Describe (without using math words) what each of the following scenarios would mean. Which of them could actually happen, and which are unrealistic?

e. i. f is zero.
    ii. f is positive.
    iii. f is negative.
    iv. f' is zero.
    v. f' is positive.
    vi. f' is negative.

Example: A ball is thrown into the air. The input of f is time, and the output of f is the height of the ball above the ground.

1. As the Earth orbits the sun, the distance between them changes. The input of f is time, and the output of f is the distance.
2. Vinegar and baking soda are reacting in a bowl to form water and other chemicals. The input of f is time, and the output of f is the amount of baking soda.
3. A water tower holds water for a small town. Water is pumped in during some times and released from the tower at others. The input of f is time, and the output of f is the amount of water in the tower.
4. A baker takes a pan of fresh cookies out of the oven and sets them on the kitchen counter. The input of f is time, and the output of f is the temperature of the cookies.
5. A fidget spinner factory is deciding how many fidget spinners to make each week. The input of f is the number of fidget spinners per week, and the output of f is the total cost incurred by the factory per week.
6. The population of a city changes. The input of f is time, and the output of f is the population of the city.
7. A rumor is spreading like wildfire across Dartmouth. The input of f is time, and the output of f is the number of people who have heard the rumor.
8. A population of deer lives in a forest. The input of f is the time, and the output of f is the number of deer.