

# Problem Set 1-1

1. *Archery Problem 1:* An archer climbs a tree near the edge of a cliff, then shoots an arrow high into the air. The arrow goes up, then comes back down, going over the cliff and landing in the valley, 30 m below the top of the cliff. The arrow's height,  $y$ , in meters above the top of the cliff depends on the time,  $x$ , in seconds, since the archer released it. Figure 1-1g shows the height as a function of time.

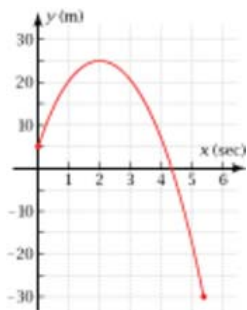


Figure 1-1g

- a. What was the approximate height of the arrow at 1 second? At 5 seconds? How do

you explain the fact that the height is negative at 5 seconds?

- b. At what *two* times was the arrow at 10 m above the ground? At what time does the arrow land in the valley below the cliff?
- c. How high was the archer above the ground at the top of the cliff when she released the arrow?
- d. Why can you say that altitude is a *function* of time? Why is time *not* a function of altitude?
- e. What is the domain of the function? What is the corresponding range?
2. *Gas Temperature and Volume Problem:* When you heat a fixed amount of gas, it expands, increasing its volume. In the late 1700s, French chemist Jacques Charles used numerical measurements of the temperature and volume of a gas to find a quantitative relationship between these two variables. Suppose that these temperatures and volumes had been recorded for a fixed amount of oxygen.