

Calculus

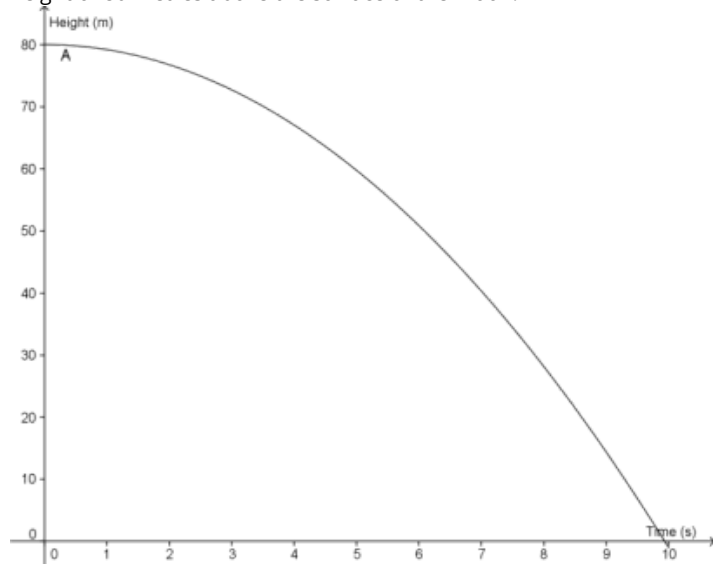
Chapter 2: Limits and Continuity

Lesson 5: Applications of Limits

Question #1

Reference Q.243

The following diagram displays the trajectory of a rock dropped from a height of 80 metres above the surface of the moon.



- What was the average velocity of the rock over the first 10 seconds?
- What was the average speed of the rock over the first 10 seconds?
- Estimate the instantaneous velocity of the rock at $t = 4 \text{ sec}$.
- Sketch an instantaneous velocity versus time graph for the first 10 seconds of the rock's fall.

Question #2

Reference Q.244

For the function $f(x) = \frac{2}{x}$ for the interval $[1, 6]$:

- Find the average rate of change over the interval.
- Find the instantaneous rate of change at $x = 2$
- Find the instantaneous rate of change at $x = a$. (i.e. At any value of x .)

Question #3

Reference Q.245

For the function $f(x) = \sqrt{x}$ for the interval $[1, 4]$:

- Find the average rate of change over the interval.
- Find the instantaneous rate of change at $x = a$.
- Use the answer in b) to find the instantaneous rate of change at $x = 2$.

Question #4

Reference Q.246

A rabbit is running away from a fox and covers a distance of $d = 6t^2$, where t is the total time travelled in seconds, and d is the distance in feet.

- What was the average velocity of the rabbit over the first 5 seconds?
- What was the instantaneous velocity of the rabbit at $t = 4 \text{ sec}$?
- What assumption(s) are we making when we say that the rabbit can cover a distance of $d = 6t^2$?

Question #5

Reference Q.247

A particle travels along the x axis according to the following equation:

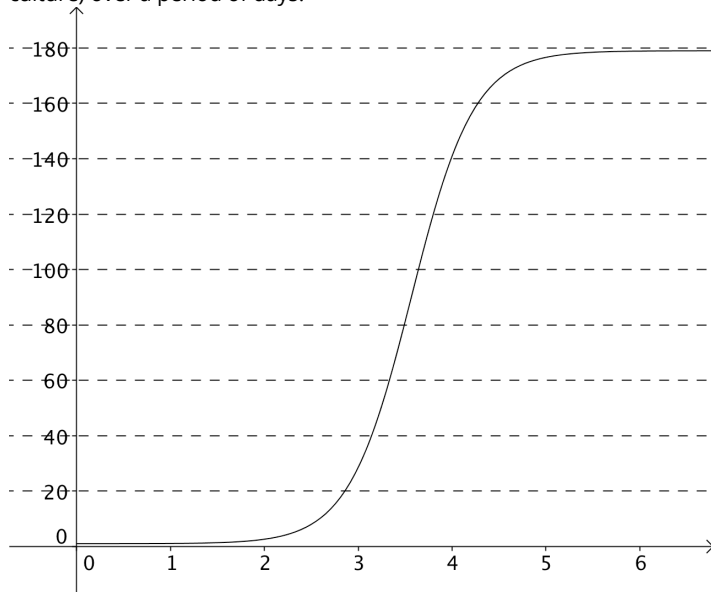
$$x(t) = 2t^2 - 8t + 6.$$

- Use a graphing calculator to sketch a graph of the function on the interval $[0, 3]$.
- What is the particle's displacement from $t = 0$ to $t = 3$?
- What is the average velocity of the particle over the first 3 seconds?
- What distance does the particle travel from $t = 0$ to $t = 3$?

Question #6

Reference Q.248

The following graph shows the growth of a bacteria culture in a lab dish. The growth is measured in **mm** (diameter of the bacteria culture) over a period of days.



- When is the growth rate the greatest?
- Estimate the growth rate at 4.5 days.
- Sketch a graph of the rate of growth over the first 6 days.