

Rates of Change -- Review

1. Bugs Bunny fires an arrow into the air and its height $h(t)$ in metres at time (s) is given by:

Time	Height
0	-3
1	17
2	27
3	27
4	17

- a) Determine the finite differences and the function that matches the table.
 - b) Determine the average velocity of the arrow from 2 to 4 seconds.
 - c) Determine the instantaneous velocity at 4 seconds.
 - d) When did the arrow come back down and hit the ground?
2. Sketch the graph of distance vs. time that matches the following scenario: (Assume distance is measured from the motion detector)
- You walk towards a motion detector at a constant rate, then stop briefly for a moment.
 - You continue walking towards the motion detector at a constant rate, but twice as fast as before.
 - When you reach the motion detector you pause to rest for a while, then turn around and run back to where you started.
3. Which of the following examples represent an average rate of change? If it is not an average rate of change, then explain why.
- a) the average height of the players on the basketball team is 1.9 m
 - b) the temperature of water in the pool decreased by 5°C over 3 days
 - c) the snowboarder raced across the finish line at 60 km/h
 - d) approximately 30 cm of snow fell over a 5 hour period
4. For a person at rest, the function $P(t) = -20 \cos\left(\frac{5\pi}{3}t\right) + 100$ models blood pressure, in millimetres of mercury (mm Hg), at time t seconds. Determine the average rate of change over the following intervals:
- a) $1 \leq t \leq 1.1$
 - b) $0.9 \leq t \leq 1$
5. The function $f(x) = -0.005x^2 + 0.8x + 12$ models the relationship between a certain vehicle's speed and fuel economy, where $f(x)$ is the fuel economy in km/L, and x is the speed of the vehicle in km/h.
- a) Estimate the instantaneous rate of change when the speed of the vehicle is 60 km/h, by calculating the average rate of change over the following intervals:
 - i) $59 \leq t \leq 60$
 - ii) $60 \leq t \leq 61$
 - b) Calculate the actual instantaneous velocity when the speed of the vehicle is 60 km/h.