How Fast Does a Penny Fall from the Empire State Building?

A penny is dropped from the top of the Empire State Building, from a height of 1,250 feet. The height of the penny, in feet, t seconds after it is dropped is given by the function $H(t) = 1250 - 16t^2$.

1. Complete the table to show the height of the penny at each of the given times.

t (seconds)	0	2	4	6	8
$H(t)$ (feet)					

2. Find the exact time t when the penny reaches the ground.

3. Find the average rate of change in the penny's height during the total length of its drop.

4. Determine how many feet the penny fell during each two second interval. What do you notice?

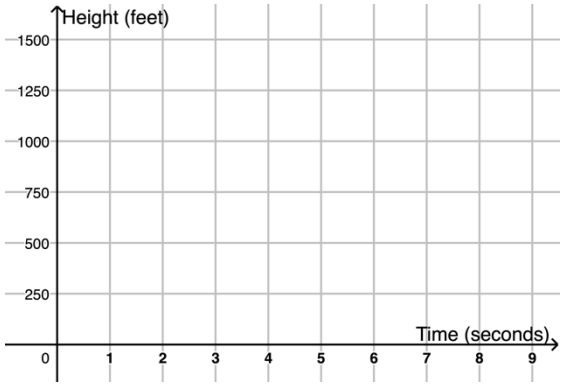
5. Complete the table with the average rate of change of the height of the penny.

Time interval	$0 \le t \le 2$	$2 \le t \le 4$	$4 \le t \le 6$	$6 \le t \le 8$
Average rate of change of H over that interval				

6. Is the penny speeding up, slowing down, or falling at a constant speed? How do you know?

7. Graph $y = H(t)$.

8. Is the graph of H concave up or concave down? What does this mean in the context of the problem?

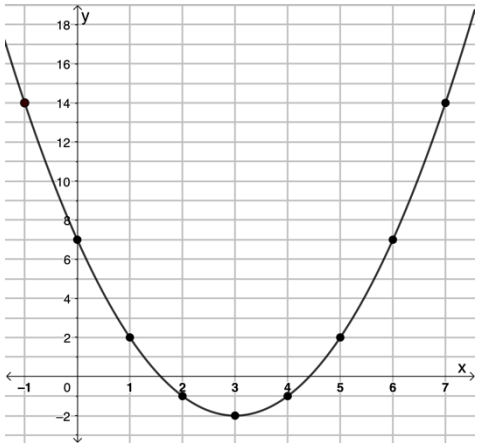


Lesson 1.6 – Change in Quadratic Functions

QuickNotes

Check Your Understanding

1. The quadratic function $y = f(x)$ is shown.



   a. Find the average rate of change of f on each of the following intervals:
      - [-1,0]
      - [0,1]
      - [1,2]
      - [2,3]
      - [3,4]
      - [4,5]
      - [5,6]
      - [6,7]

   b. Find the rate of change of the average rates of change.

   c. Is the graph of f concave up or concave down? How does this support your answer in part b?

2. Selected values of a function g are given. Complete the table so that g is a quadratic function.

x	-8	-4	0	4	8	12	16	18
$g(x)$	1		24	31	35			