Tangents and Velocities: Examples

SYMPLIT

1. When a rock is thrown into the air on the surface of the moon at a velocity of 10 m/s^2, its height is given by the function $h(t) = 10t - 3.1t^2$ where t is measured in seconds.

   (a) Find the average velocity for the time period beginning with $t = 1$ and lasting

   i. .4 seconds
   ii. .1 seconds
   iii. .04 seconds
   iv. .01 seconds

   (b) Estimate the instantaneous velocity when $t = 1$.

2. The following table gives the position of a driver

t (seconds)	0	1	2	3	4	5	6
s (feet)	0	4	12	28	64	180	240

   (a) Find the average velocity for each time interval:

   i. $[1, 4]$
   ii. $[2, 4]$
   iii. $[3, 4]$
   iv. $[3, 5]$
   v. $[4, 5]$
   vi. $[4, 6]$

   (b) Graph s as a function of t, and use the graph to estimate the instantaneous velocity when $t = 4$.

3. The displacement of a particle moving along the x-axis is given by the equation

$$s = \sin\left(\frac{\pi t}{2}\right) + 2\cos\left(\frac{\pi t}{2}\right)$$

   Find the average velocity for the time interval $[0, 2]$ and the time interval $[0, 1]$.

4. Consider the curve $y = x^2$.

   (a) Find the slope of the secant line connecting the values of x:

   i. $x = -3$ and $x = -1$
   ii. $x = -2$ and $x = -1$
   iii. $x = -1.1$ and $x = -1$

   (b) Estimate the slope of the tangent line at $x = -1$, and use it to find the equation of the tangent line.