
The Tangent and Velocity Problems

Solutions should show all of your work, not just a single final answer.

1. The point $P(0.5, 0)$ lies on the curve $y = \cos(\pi x)$ where x is in **radians**.
 - (a) If Q is the point $(x, \cos(\pi x))$, use your calculator to find the slope of the secant line PQ (correct to four decimal places) for the following values of x :

(i) 0.4 (ii) 0.49 (iii) 0.499 (iv) 0.6 (v) 0.51 (vi) 0.501
 - (b) Using the results of part(a), estimate the value of the slope of the tangent line to the curve at $P(0.5, 0)$.
 - (c) Using the slope from part(b), find the equation of the tangent line to the curve at $P(0.5, 0)$, writing the answer as $y = mx + b$.

2. The displacement of an object on a line, in meters, is $s = 1 + 2t + \frac{1}{4}t^2$, where t is in seconds.
 - (a) Find the average velocity in m/sec over each of the following time periods. For parts a, b, and c, give the answer to 4 digits after the decimal point. In part d, h is a nonzero variable (so the answer can be in terms of h).

(i) $[1, 1.5]$ (ii) $[1, 1.1]$ (iii) $[1, 1.01]$ (iv) $[1, 1 + h]$
 - (b) Estimate the instantaneous velocity at time $t = 1$, in m/sec.