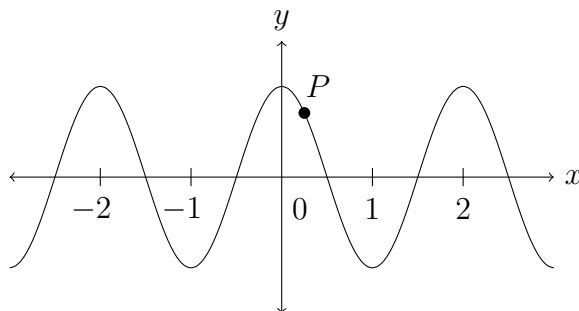

The Tangent and Velocity Problems

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

1. The point $P = (1/4, 1/\sqrt{2})$ lies on the curve $y = \cos(\pi x)$ where x is in **radians**, as shown below.



- (a) If $Q = (x, \cos(\pi x))$ then use your calculator to find the slope of the secant line PQ , rounded to four digits after the decimal point, for the following values of x :
- (i) 0.24, (ii) 0.249, (iii) 0.2499, (iv) 0.26, (v) 0.251, (vi) 0.2501.
- (b) Using the results of part(a), estimate the value of the slope of the tangent line to the curve at $(1/4, 1/\sqrt{2})$ to three digits after the decimal point.
- (c) Using the estimated slope from part(b), what is an estimate for the equation of the tangent line to the graph of $y = \cos(\pi x)$ at $(1/4, 1/\sqrt{2})$? Write the final answer in the form $y = mx + b$ where m and b are each rounded to three digits after the decimal point.
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 (i) through (v), round your answer to three digits after the decimal point. In part (vi), h is a nonzero variable and the final answer is in terms of h .
- (i) [1, 1.5] (ii) [1, 1.1] (iii) [1, 1.01] (iv) [1, .9] (v) [1, .99] (vi) [1, 1 + h]
- (b) Use the work in part a to estimate the instantaneous velocity of the object at time $t = 1$, in m/sec.