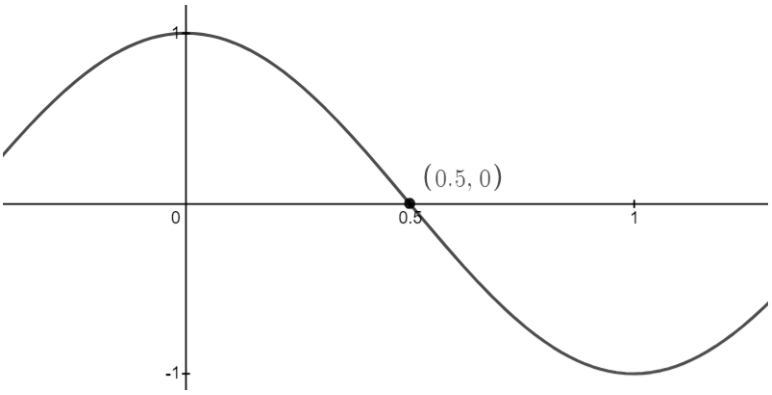
Exercise 1 The point $P(0.5, 0)$ lies on the curve $y = \cos(\pi x)$.



(a) If Q is the point $(x, \cos(\pi x))$, use your calculator to find the slope of the secant line PQ (correct to six decimal places) for the following values of x:

(i) 0

(ii) 0.4

(iii) 0.49

(iv) 0.499

(v) 1

(vi) 0.6

(vii) 0.51

(viii) 0.501

(b) Guess the value of the slope of the tangent line to the curve at $P(0.5, 0)$.

(c) Find an equation of the tangent line to the curve at $P(0.5, 0)$.

(d) Sketch two of the secant lines (one connecting P to a point on left and one connecting P to a point on right) and the tangent line at $P(0.5, 0)$.

Exercise 2 If a rock is thrown upward on the planet Mars with a velocity of 10 m/s, its height in meters t seconds later is given by $y = 10t - 1.86t^2$.

(a) Find the average velocity over the given time intervals:

(i) [1, 2]

(ii) [1, 1.5]

(iii) [1, 1.1]

(iv) [1, 1.01]

(v) [1, 1.001]

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

Exercise 3 The displacement (in centimeters) of a particle moving back and forth along a straight line is given by the equation of motion $s = 2\sin(\pi t) + 3\cos(\pi t)$, where t is measured in seconds.

(a) Find the average velocity during each time period:

(i) [1, 2]

(ii) [1, 1.1]

(iii) [1, 1.01]

(iv) [1, 1.001]

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