Root Finding Technique: Secant Method

Yesterday, we learned how to find the root for the following simple equation using the bisection method

\[ y = x^2 - 10 \]

Today, we are going to learn a “better” variant of the bisection method called the secant method.

- **Secant method:**
  The bisection method only makes use of the sign of the functional value in finding the root and completely discards the magnitude of the function. This is a total waste of available information!! The spirit of the secant method is precisely targeted to making use of this “magnitude” information in root finding.

Step 1: Choose a lower and upper bound for an x-interval until the function changes sign between the bounds.

Step 2: Approximate the functional behavior by using a straight line which joins the functional values at the lower and upper bounds.

Step 3: Solve for the root location associated with the straight line approximation.

Step 4: Decide if the real root lies to the left or right of the approximate root.

Step 5: Repeat Step 1 through Step 4 until the root is found to a specific precision.

Write a Matlab program to implement the secant method for root finding. Solve the above equation and print out all the iterations necessary to achieve an accuracy of 0.00001 with a starting lower and bound at \( x = 0 \) and 5 respectively. Finally, compare the performance of this method with that of the bisection method.