

### 5.3 Programming Solution

#### Function Definition

$$f(x) := -25 + 82 \cdot x - 90 \cdot x^2 + 44 \cdot x^3 - 8 \cdot x^4 + 0.7 \cdot x^5$$

#### Program for Bisection Algorithm

$x_l := 0.5$     $x_u := 1$    starting interval  
 $N := 10$    maximum number of iterations  
 $\varepsilon_s := 10$    stopping error

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(n  x_r  ε_a) :=
  x_l_0 ← x_l
  x_u_0 ← x_u
  for i ∈ 0 .. N - 1
    x_r_i ← (x_l_i + x_u_i) / 2
    ε_a_i ← (|x_u_i - x_l_i| / (x_u_i + x_l_i)) · 100
    break if ε_a_i < ε_s
    f_l_i ← f(x_l_i)
    f_u_i ← f(x_u_i)
    f_r_i ← f(x_r_i)
    x_l_{i+1} ← if (f_l_i · f_r_i < 0, x_l_i, x_r_i)
    x_u_{i+1} ← if (f_u_i · f_r_i < 0, x_u_i, x_r_i)
  (i + 1  x_r  ε_a)
  
```

$$n = 4 \quad x_r = \begin{pmatrix} 0.75 \\ 0.625 \\ 0.563 \\ 0.594 \end{pmatrix} \quad \varepsilon_a = \begin{pmatrix} 33.333 \\ 20 \\ 11.111 \\ 5.263 \end{pmatrix}$$