6.1 Use simple fixed-point iteration to locate the root of

$$f(x) = \sin(\sqrt{x}) - x$$

Use an initial guess of $x_0 = 0.5$ and iterate until $\varepsilon_a \leq 0.01\%$. Verify that the process is linearly convergent as described in Box 6.1.

6.2 Determine the highest real root of

$$f(x) = 2x^3 - 11.7x^2 + 17.7x - 5$$

6.3 Use **(a)** fixed-point iteration and **(b)** the Newton-Raphson method to determine a root of $f(x) = -0.9x^2 + 1.7x + 2.5$ using $x_0 = 5$. Perform the computation until ε_a is less than $\varepsilon_s = 0.01\%$. Also perform an error check of your final answer.

6.4 Determine the real roots of $f(x) = -1 + 5.5x - 4x^2 + 0.5x^3$:

6.11 Use the Newton-Raphson method to find the root of

$$f(x) = e^{-0.5x}(4 - x) - 2$$

6.16 **(a)** Apply the Newton-Raphson method to the function $f(x) = \tanh(x^2 - 9)$ to evaluate its known real root at $x = 3$. Use an initial guess of $x_0 = 3.2$ and take a minimum of four iterations. **(b)** Did the method exhibit convergence onto its real root? Sketch the plot with the results for each iteration shown.

6.17 The polynomial $f(x) = 0.0074x^4 - 0.284x^3 + 3.355x^2 - 12.183x + 5$ has a real root between 15 and 20. Apply the Newton-Raphson method to this function using an initial guess of $x_0 = 16.15$. Explain your results.

6.7 Locate the first positive root of

$$f(x) = \sin x + \cos(1 + x^2) - 1$$

where x is in radians. Use four iterations of the secant method with initial guesses of **(a)** $x_{i-1} = 1.0$ and $x_i = 3.0$; **(b)** $x_{i-1} = 1.5$ and $x_i = 2.5$, and **(c)** $x_{i-1} = 1.5$ and $x_i = 2.25$ to locate the root. **(d)** Use the graphical method to explain your results.

6.8 Determine the real root of $x^{3.5} = 80$, with the modified secant method to within $\varepsilon_s = 0.1\%$ using an initial guess of $x_0 = 3.5$ and $\delta = 0.01$.