

Realizar los siguientes ejercicios seleccionados del libro de Kincaid páginas 90 a 93:

En el siguiente enlace, pueden encontrar una copia del libro de Kincaid y otros textos que pueden ser de utilidad:

[https://drive.google.com/file/d/1PEXvcfbK\\_71gky-L1xOMY0untoBkXWPu/view?usp=drive\\_link](https://drive.google.com/file/d/1PEXvcfbK_71gky-L1xOMY0untoBkXWPu/view?usp=drive_link)

### Problems 3.2

22. Starting with  $(0, 0, 1)$ , carry out an iteration of Newton's method for nonlinear systems on

$$\begin{cases} xy - z^2 = 1 \\ xyz - x^2 + y^2 = 2 \\ e^x - e^y + z = 3 \end{cases}$$

Explain the results.

23. Perform two iterations of Newton's method on these systems.

- a. Starting with  $(0, 1)$

$$\begin{cases} 4x_1^2 - x_2^2 = 0 \\ 4x_1x_2^2 - x_1 = 1 \end{cases}$$

- b. Starting with  $(1, 1)$

$$\begin{cases} xy^2 + x^2y + x^4 = 3 \\ x^3y^5 - 2x^5y - x^2 = -2 \end{cases}$$

### Computer Problems 3.2

1. Write a computer program to solve the equation  $x = \tan x$  by means of Newton's method. Find the roots nearest 4.5 and 7.7.
2. (Continuation) Write and test a program to compute the first ten roots of the equation  $\tan x = x$ . (This is much more difficult than the preceding computer problem.) *Cultural note:* If  $\lambda_1, \lambda_2, \dots$  are all the positive roots of this equation, then  $\sum_{i=1}^{\infty} \lambda_i^{-2} = 1/10$ . (*Amer. Math. Monthly*, Oct. 1986, p. 660.)
3. Find the positive minimum point of the function  $f(x) = x^{-2} \tan x$  by computing the zeros of  $f'$  using Newton's method.
4. Write a brief computer program to solve the equation  $x^3 + 3x = 5x^2 + 7$  by Newton's method. Take ten steps starting at  $x_0 = 5$ .
5. The equation  $2x^4 + 24x^3 + 61x^2 - 16x + 1 = 0$  has two roots near 0.1. Determine them by means of Newton's method.

- 13.** Carry out five iterations of Newton's method (for two nonlinear functions in two variables) on the following system:

$$\begin{cases} f_1(x, y) = 1 + x^2 - y^2 + e^x \cos y \\ f_2(x, y) = 2xy + e^x \sin y \end{cases}$$

Use starting values  $x_0 = -1$  and  $y_0 = 4$ . Is this problem related to Computer Problem **11** above, and do they have similar numerical behavior? Explain.

- 14.** Using Newton's method, find the roots of the nonlinear systems.

a. 
$$\begin{cases} 4y^2 + 4y + 52x = 19 \\ 169x^2 + 3y^2 + 111x - 10y = 10 \end{cases}$$

b. 
$$\begin{cases} x + e^{-1x} + y^3 = 0 \\ x^2 + 2xy - y^2 + \tan(x) = 0 \end{cases}$$