Courtesy of CRC Press/Taylor & Francis Group

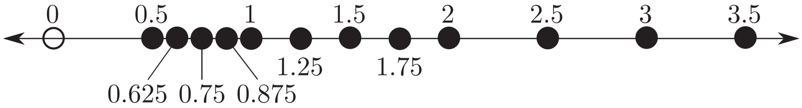

Figure 2.1 The values from Example 2.1 plotted on a number line; typical for floating- point number systems, they are unevenly spaced between the minimum (0.5) and the maximum (3.5).

002x001.eps

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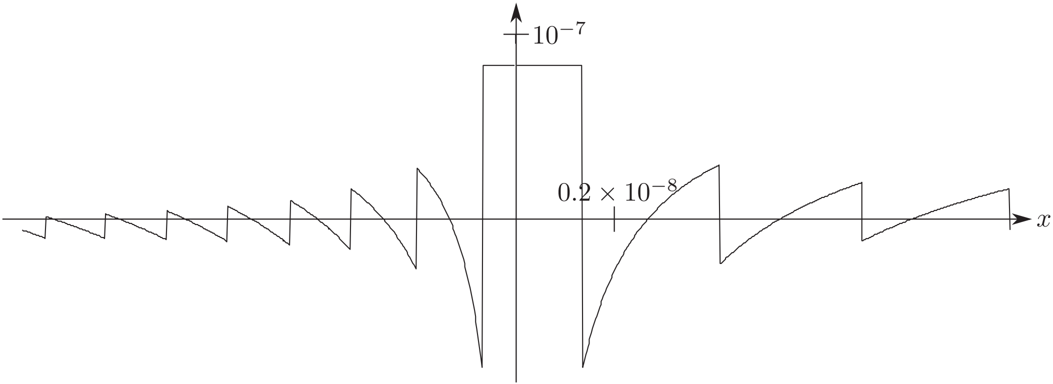

Figure 2.2 Values of f(x) from Example 2.5, computed using IEEE floating-point arithmetic.

002x002.eps

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function SIMPLE-SUM($\vec{x}$)
    $s \leftarrow 0$ ▷ Current total
    for $i \leftarrow 1, 2, \ldots, n : s \leftarrow s + x_i$
    return s

(a)

function KAHAN-SUM($\vec{x}$)
    $s, c \leftarrow 0$ ▷ Current total and compensation
    for $i \leftarrow 1, 2, \ldots, n$
        $v \leftarrow x_i + c$ ▷ Try to add x_i and compensation c to the sum
        $s_{\text{next}} \leftarrow s + v$ ▷ Compute the summation result of this iteration
        $c \leftarrow v - (s_{\text{next}} - s)$ ▷ Compute compensation using the Kahan error estimate
        $s \leftarrow s_{\text{next}}$ ▷ Update sum
    return s

(b)

Figure 2.3 (a) A simplistic method for summing the elements of a vector $\vec{x}$; (b) the Kahan summation algorithm.

002x003.eps

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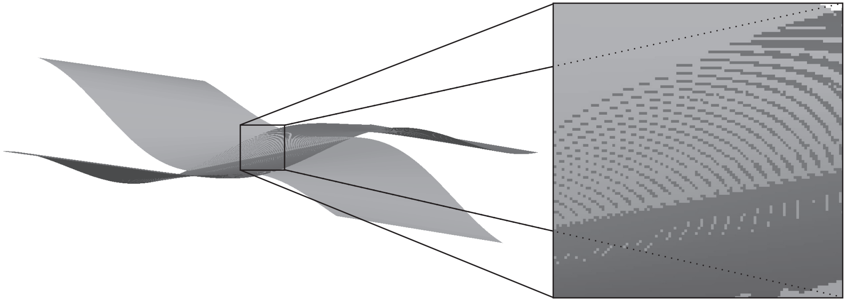

Figure 2.4 z-fighting, for Exercise 2.6; the overlap region is zoomed on the right.

002x004.eps