# Tables & Figures for Interpolation and Approximation

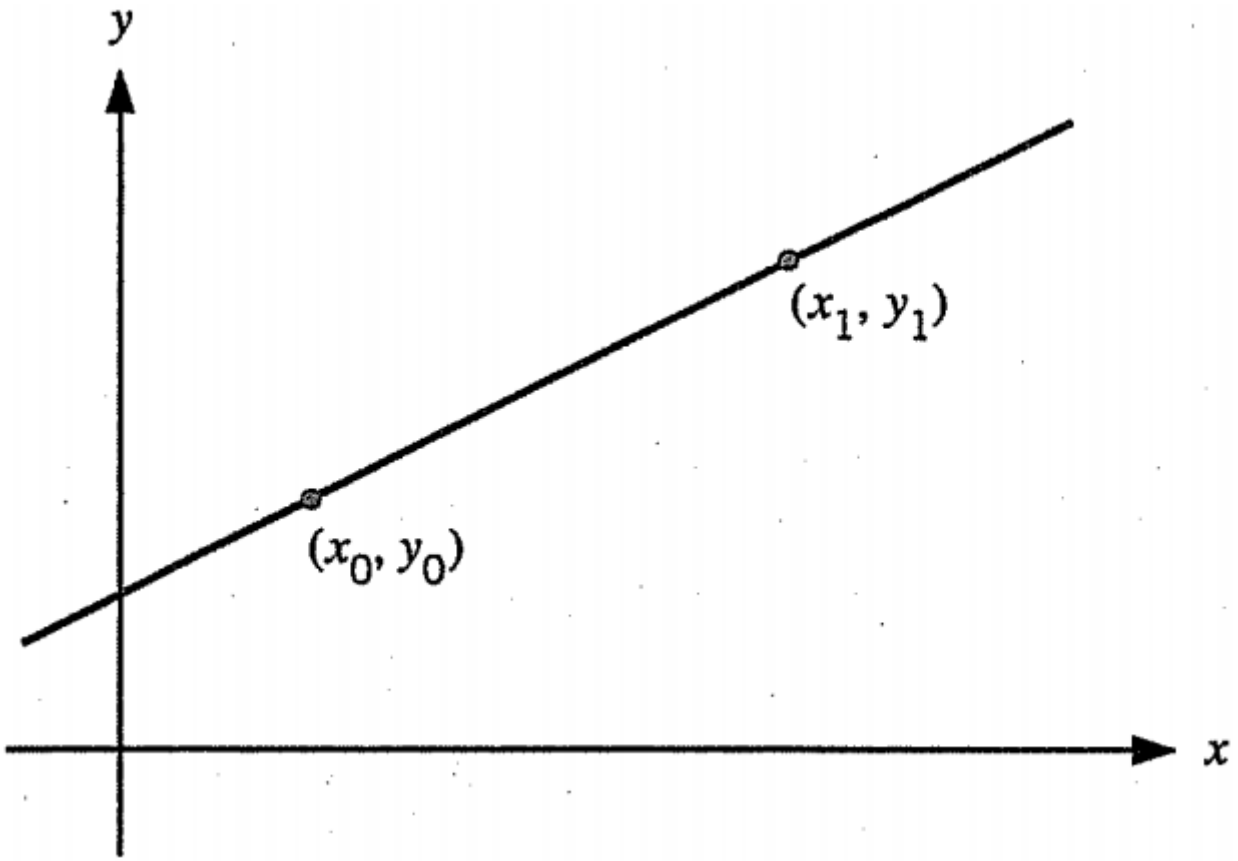


**Figure 4.1.** Linear interpolation

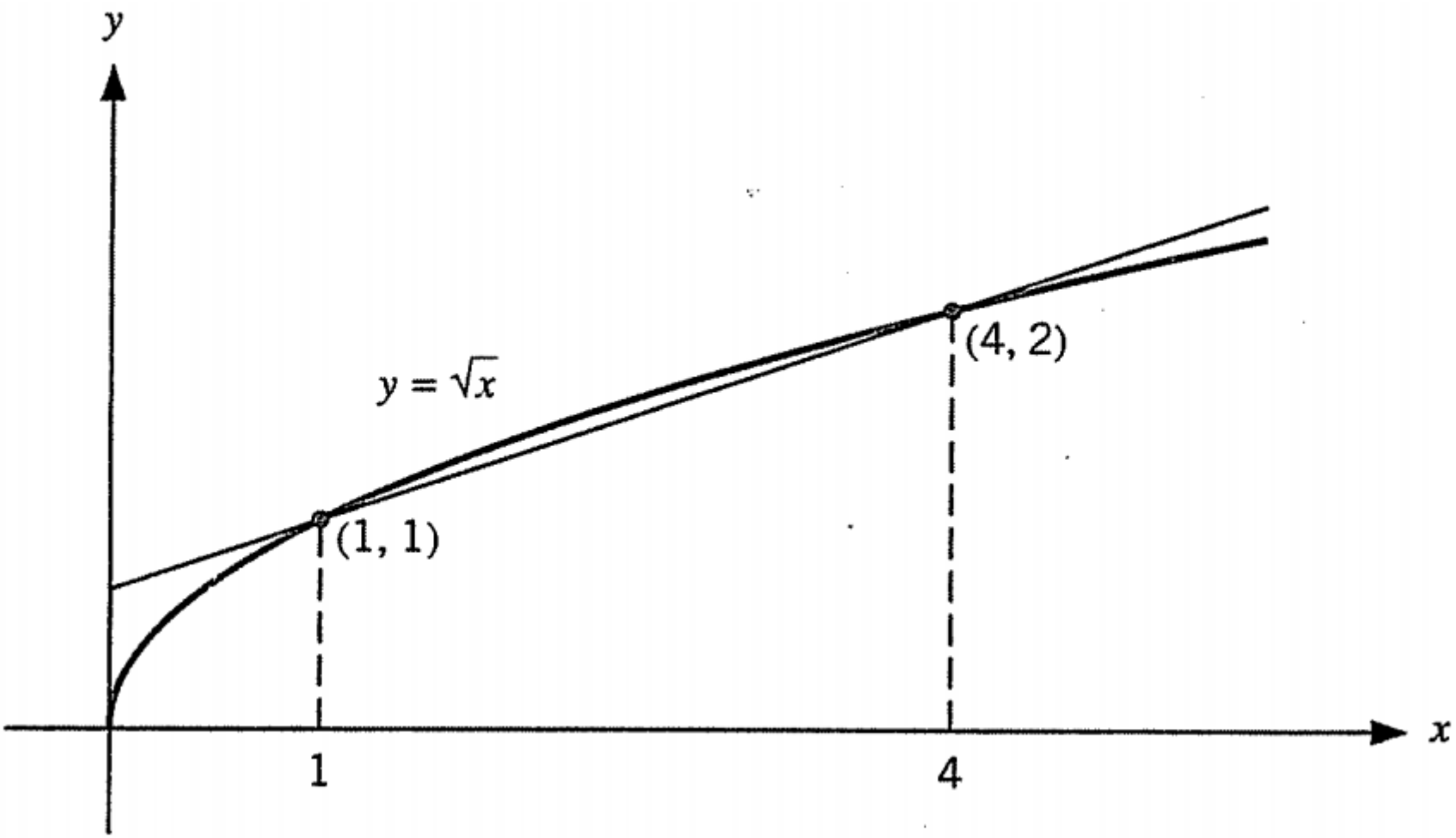


**Figure 4.2.** y=$\sqrt{x}$ and its linear interpolating polynomial (4.2)

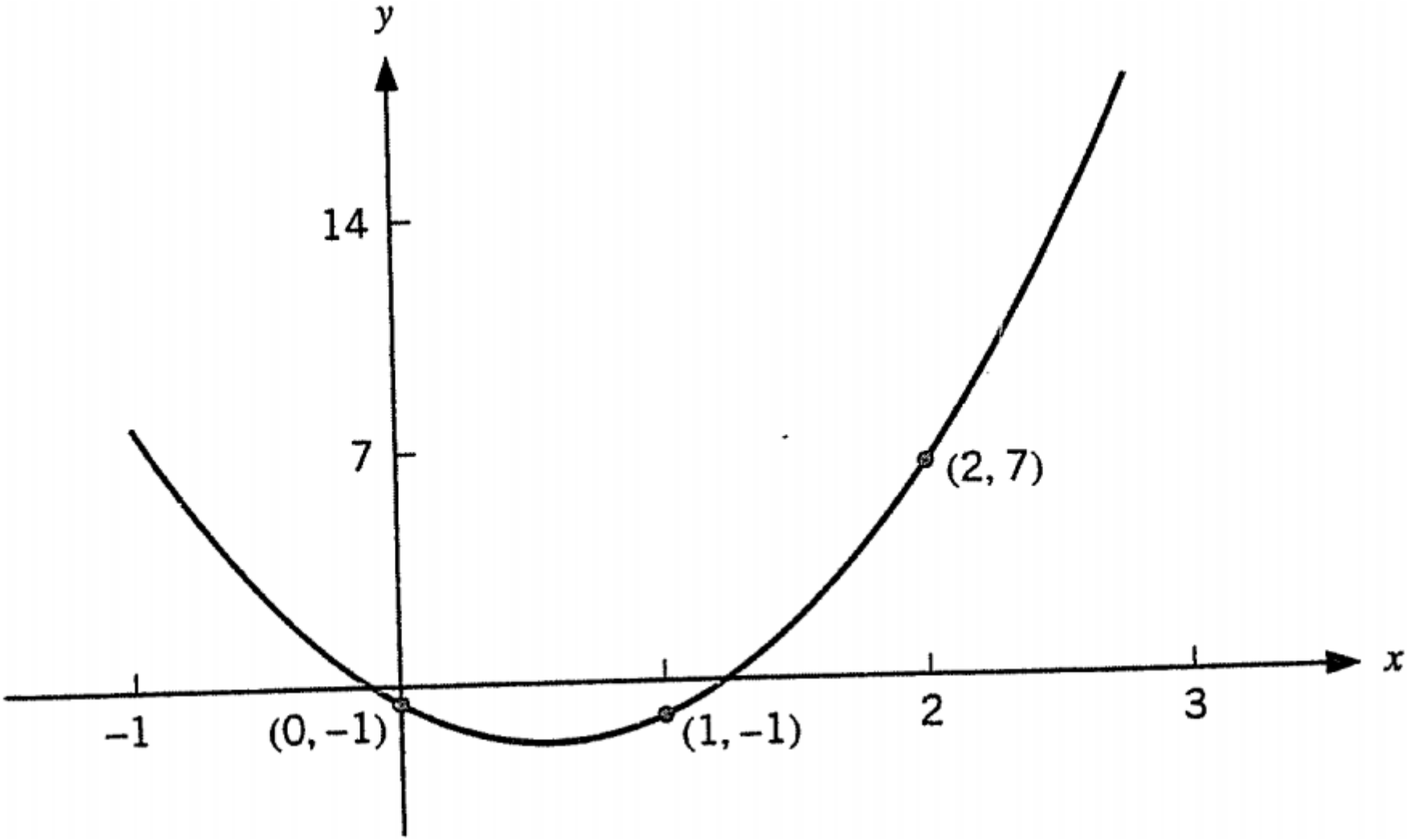


**Figure 4.3.** The quadratic interpolating polynomial

(4.9)

| | $P_n(0.1)$ | $P_n(0.3)$ | $P_n(0.5)$ |
|---|---|---|---|
| 1 | 0.9900333 | 0.9700999 | 0.9501664 |
| 2 | 0.9949173 | 0.9554478 | 0.8769061 |
| 3 | 0.9950643 | 0.9553008 | 0.8776413 |
| 4 | 0.9950071 | 0.9553351 | 0.8775841 |
| 5 | 0.9950030 | 0.9553369 | 0.8775823 |
| 6 | 0.9950041 | 0.9553365 | 0.8775825 |
| True | 0.9950042 | 0.9553365 | 0.8775826 |

**Table 4.2.** Interpolation to $\cos(x)$

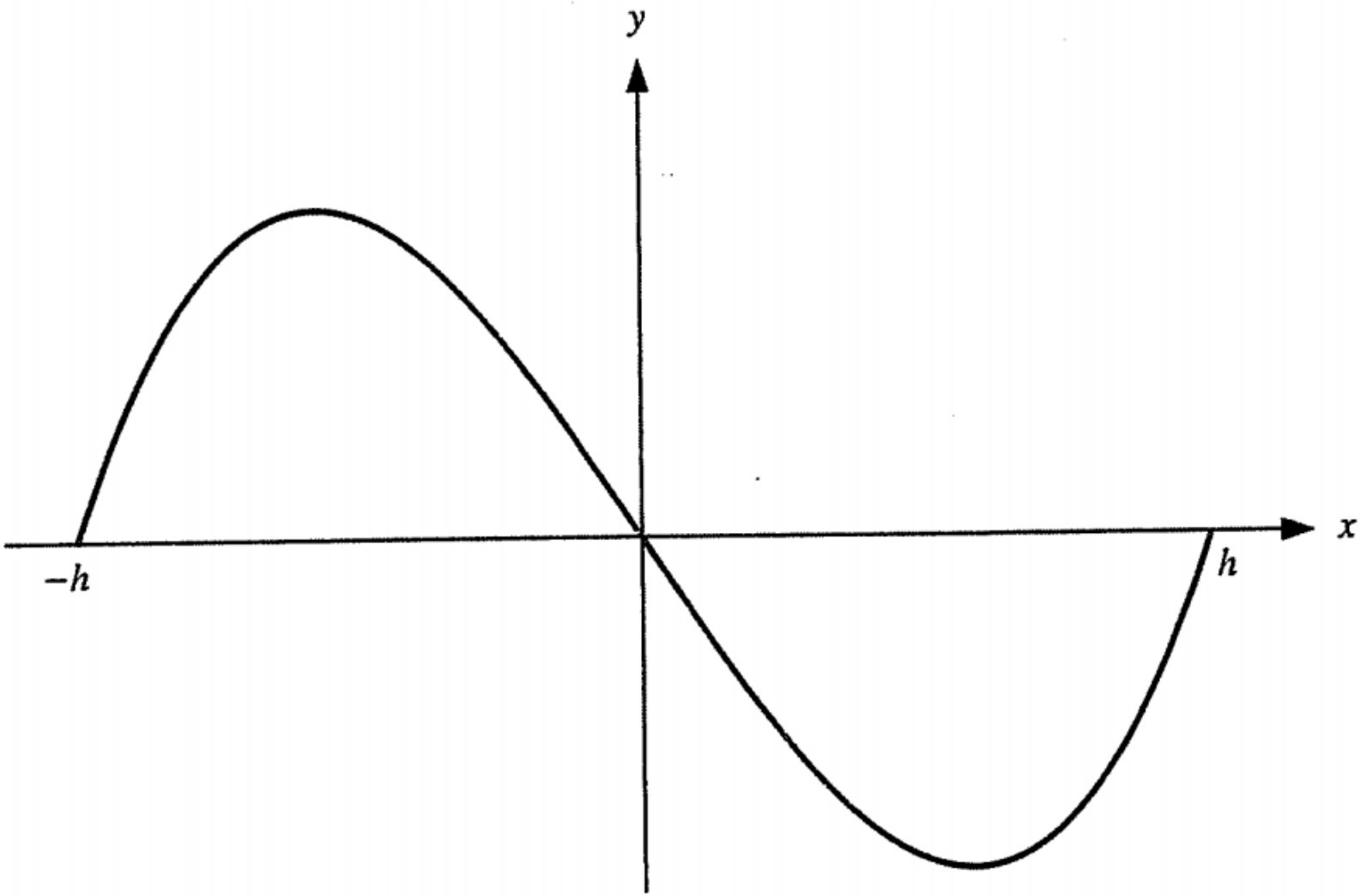


**Figure 4.4.** $y=w_2(x)$

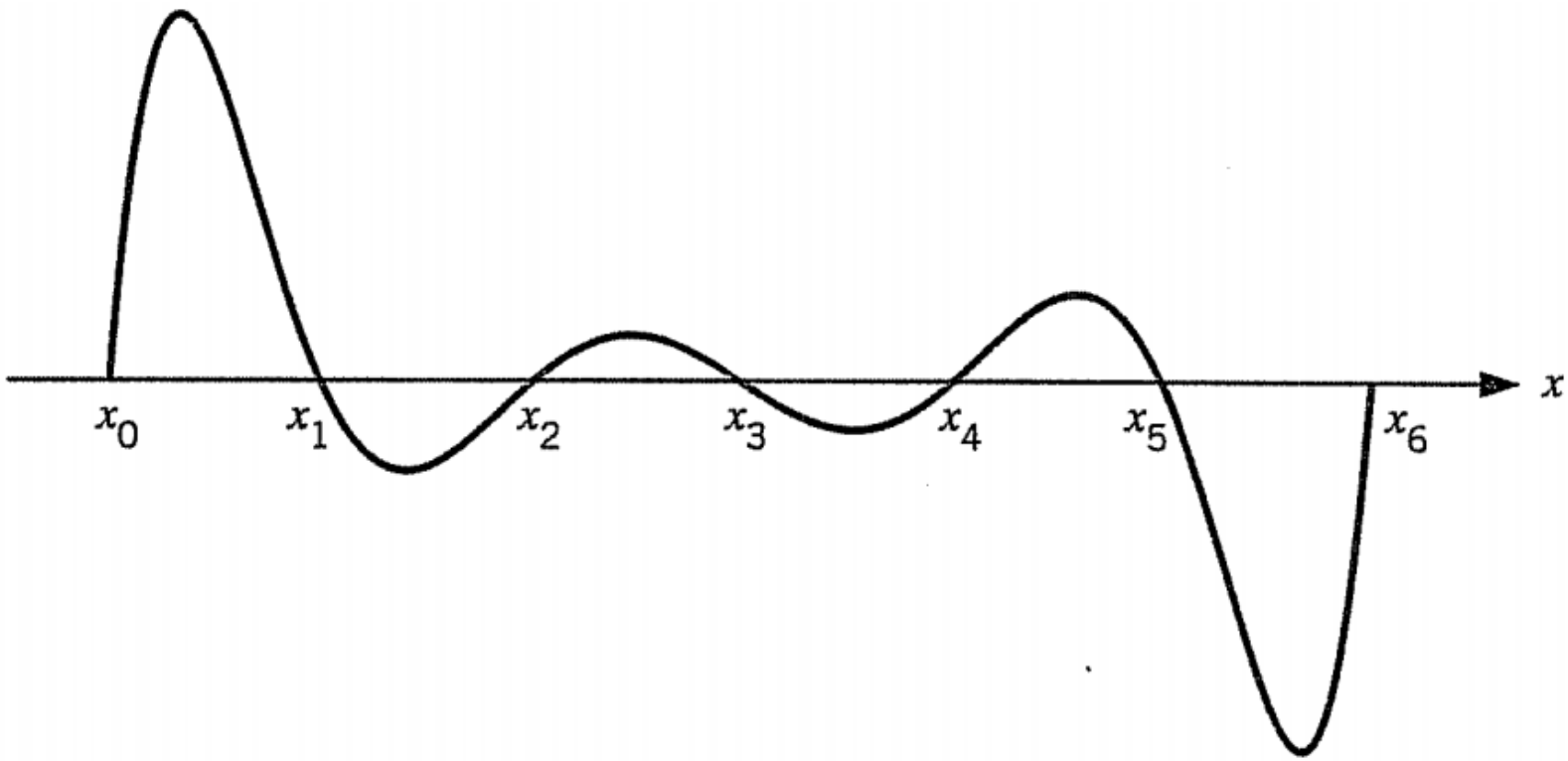


**Figure 4.5.** $y=\psi_6(x)$

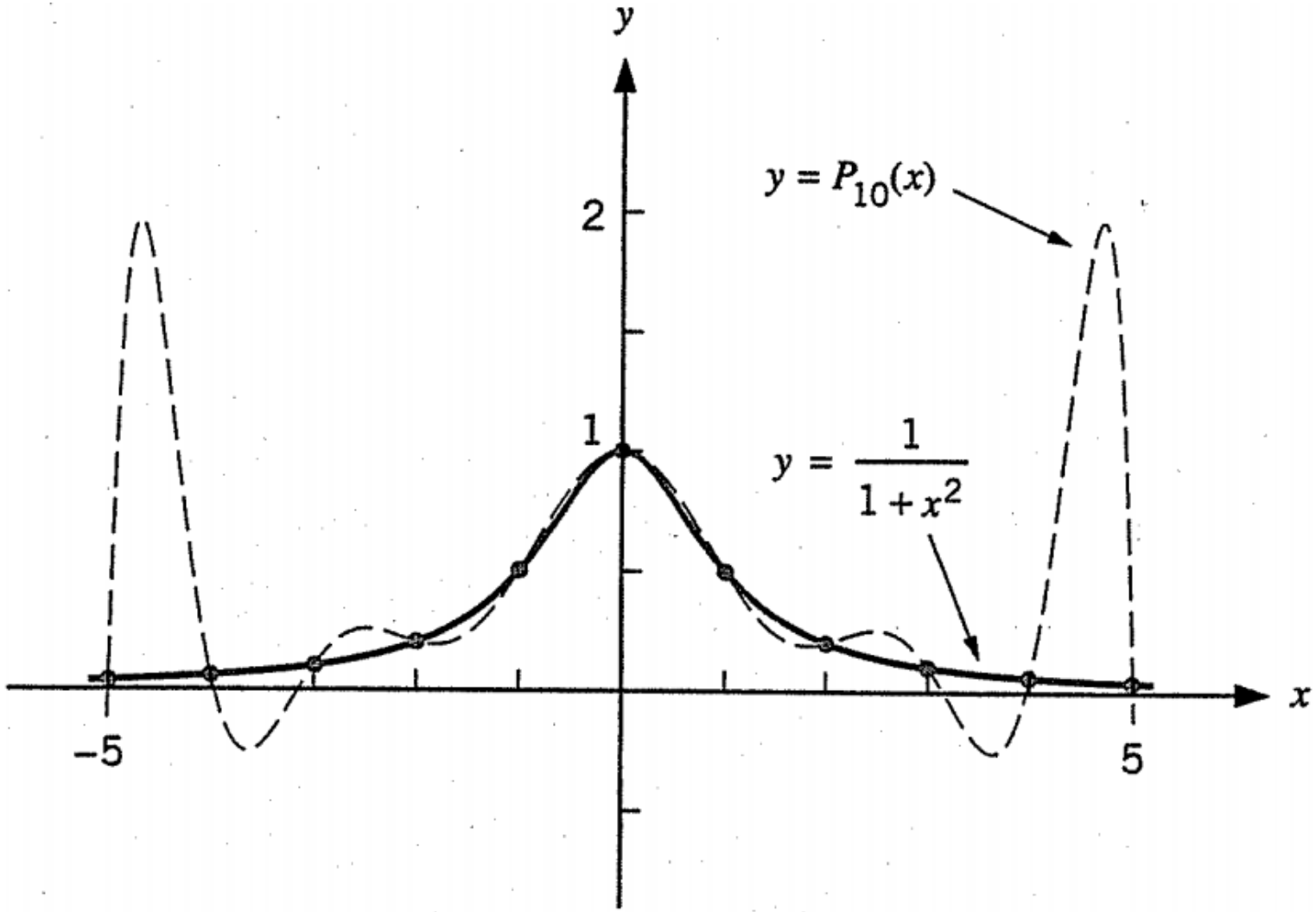


**Figure 4.6.** The interpolation to $1/(1+x^2)$

| $x$ | 0 | 1 | 2 | 2.5 | 3 | 3.5 | 4 |
|---|---|---|---|---|---|---|---|
| $y$ | 2.5 | 0.5 | 0.5 | 1.5 | 1.5 | 1.125 | 0 |

**Table 4.3.** Interpolation Data Points

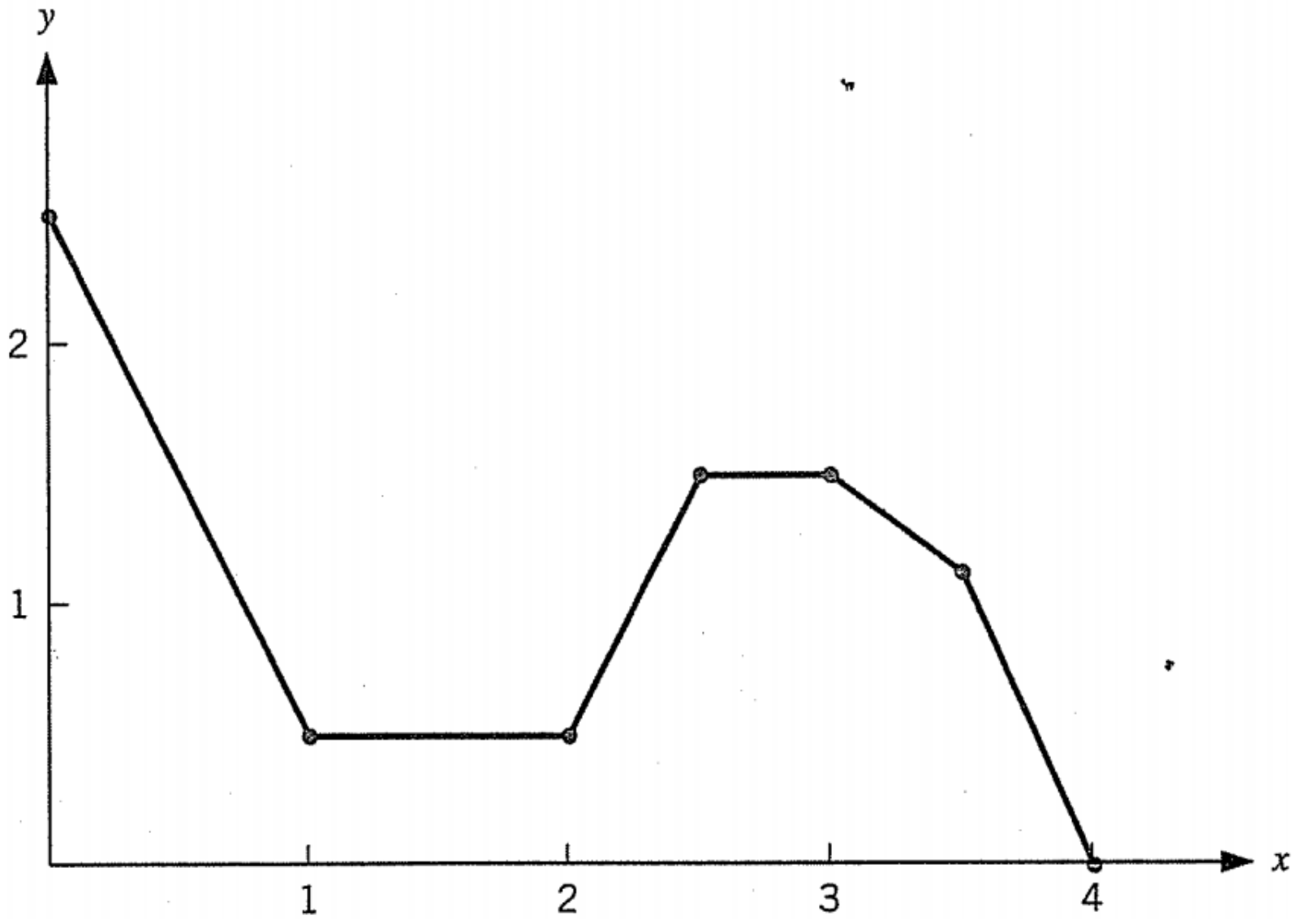


**Figure 4.7.** $y=l(x)$: piecewise linear interpolation

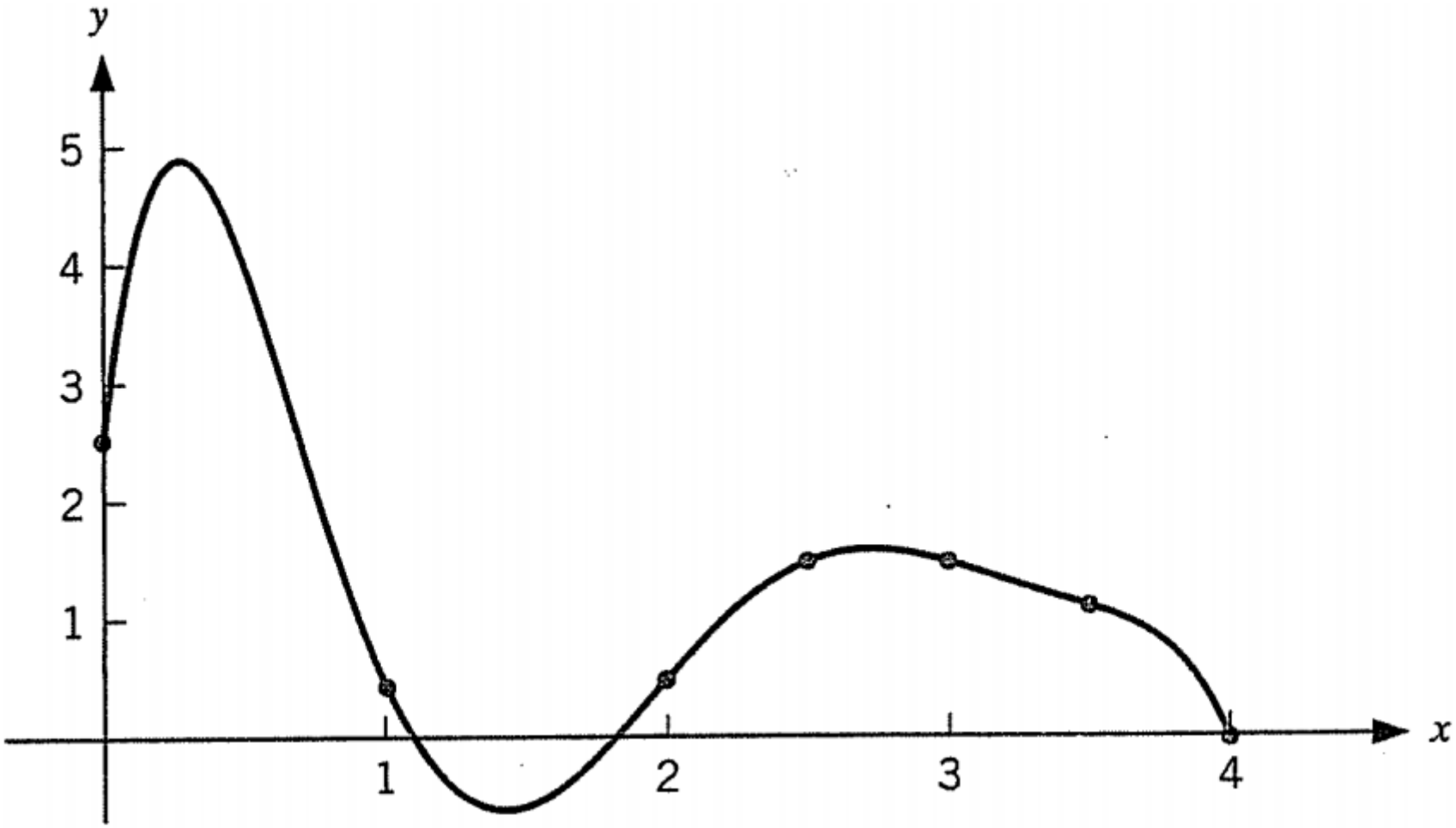


**Figure 4.8.** $y=P_6(x)$: polynomial interpolation

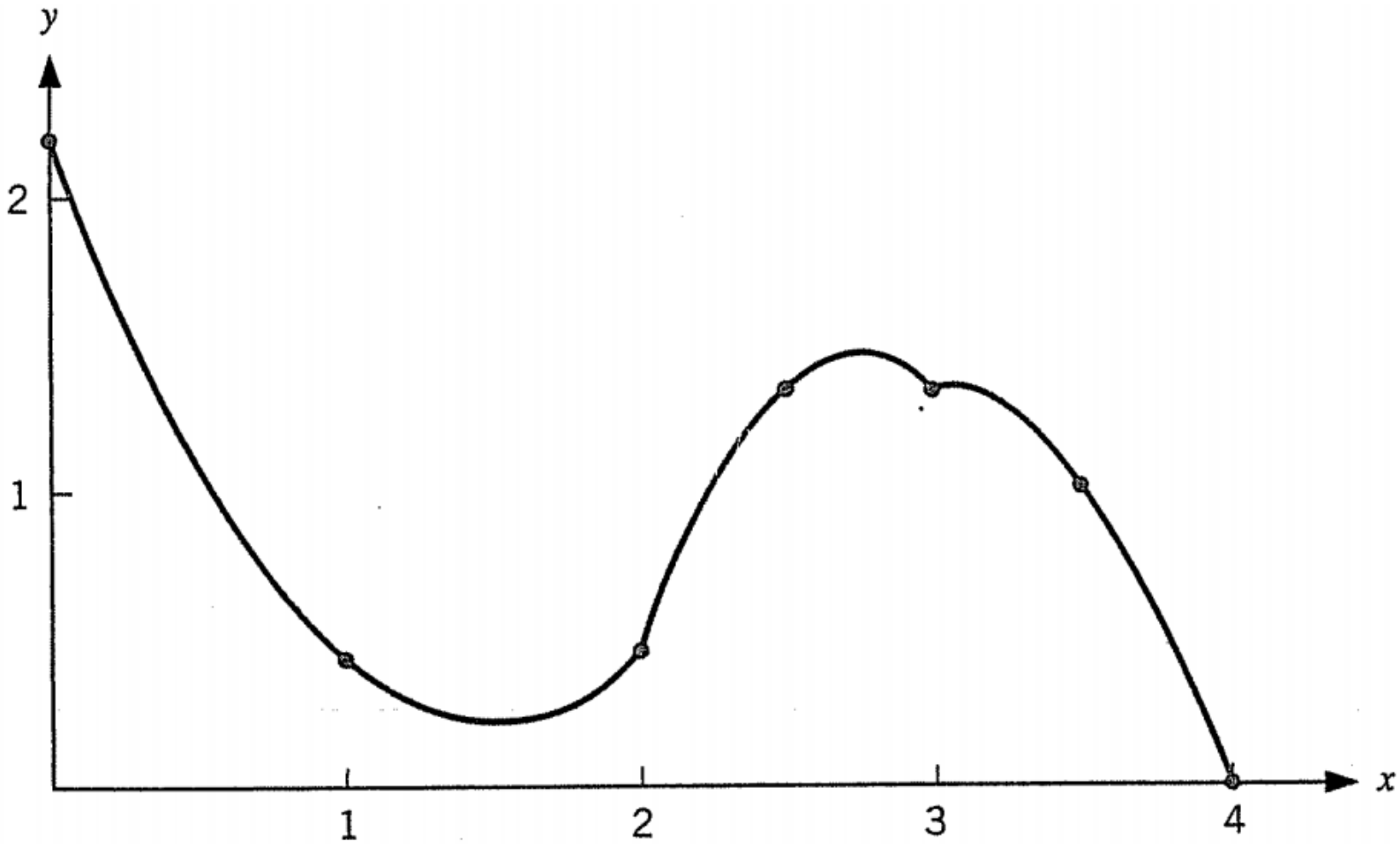


**Figure 4.9.** $y=q(x)$: piecewise quadratic interpolation

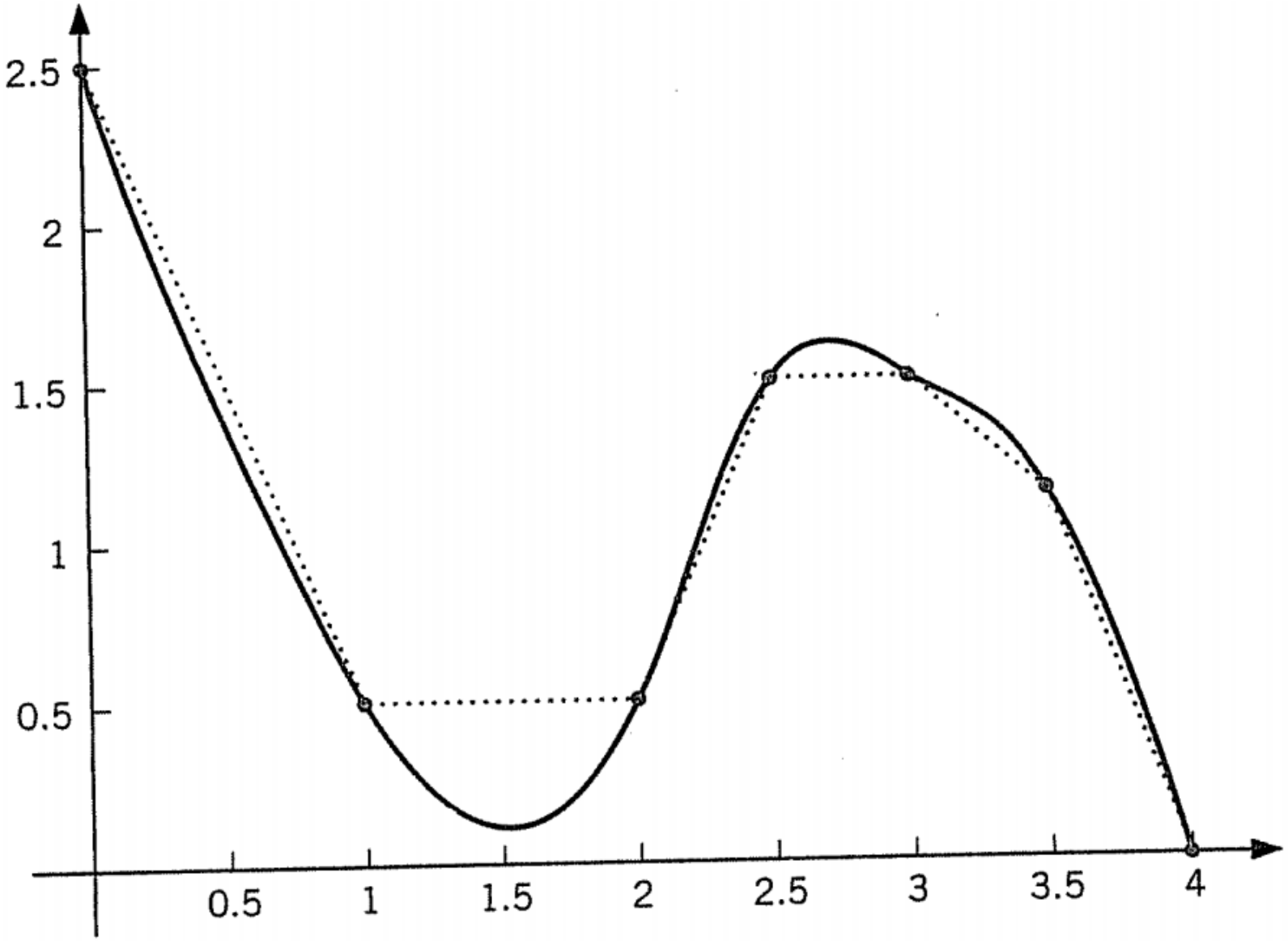


**Figure 4.10.** Natural cubic spline interpolation (solid line) and piecewise linear interpolation (dotted line)

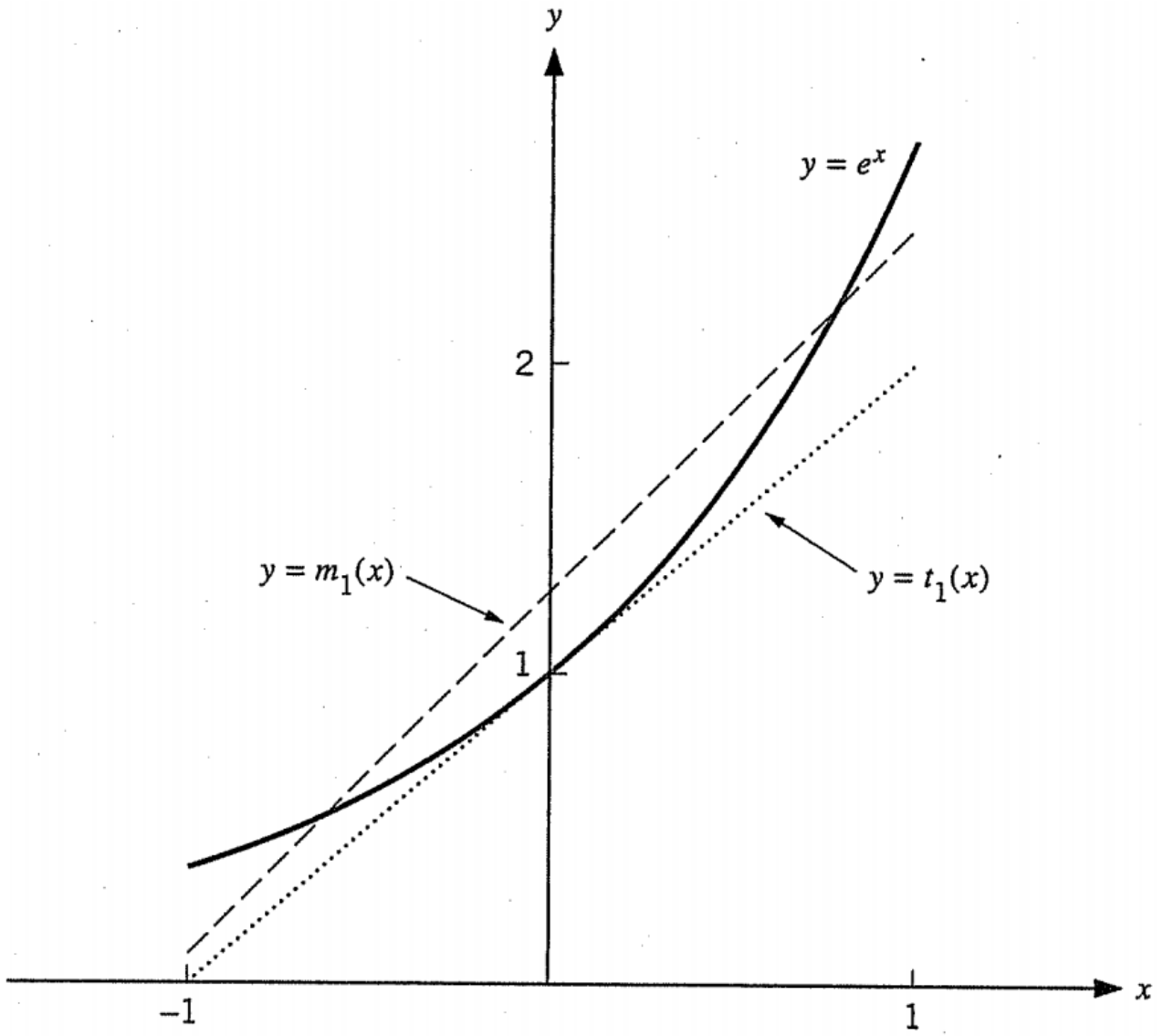


**Figure 4.12.** Two linear approximations to $e^x$

| | Maximum Error in: | |
|---|---|---|
| $n$ | $t_n(x)$ | $m_n(x)$ |
| 1 | 7.18E − 1 | 2.79E − 1 |
| 2 | 2.18E − 1 | 4.50E − 2 |
| 3 | 5.16E − 2 | 5.53E − 3 |
| 4 | 9.95E − 3 | 5.47E − 4 |
| 5 | 1.62E − 3 | 4.52E − 5 |
| 6 | 2.26E − 4 | 3.21E − 6 |
| 7 | 2.79E − 5 | 2.00E − 7 |
| 8 | 3.06E − 6 | 1.11E − 8 |
| 9 | 3.01E − 7 | 5.52E − 10 |

**Table 4.5.** Taylor and Minimax Errors for $e^x$ on [-1, 1]

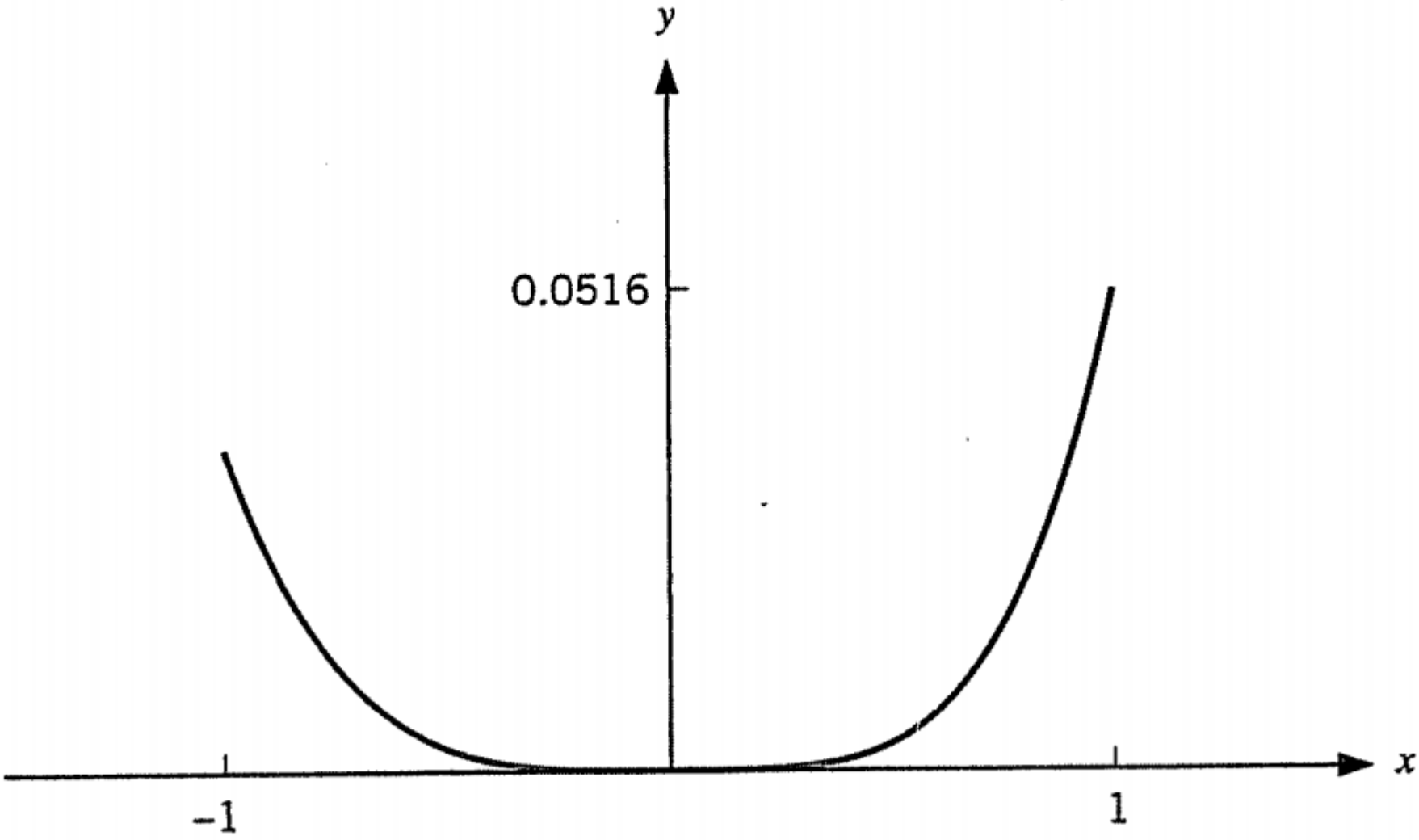


**Figure 4.13.** $e^x - t_3(x)$

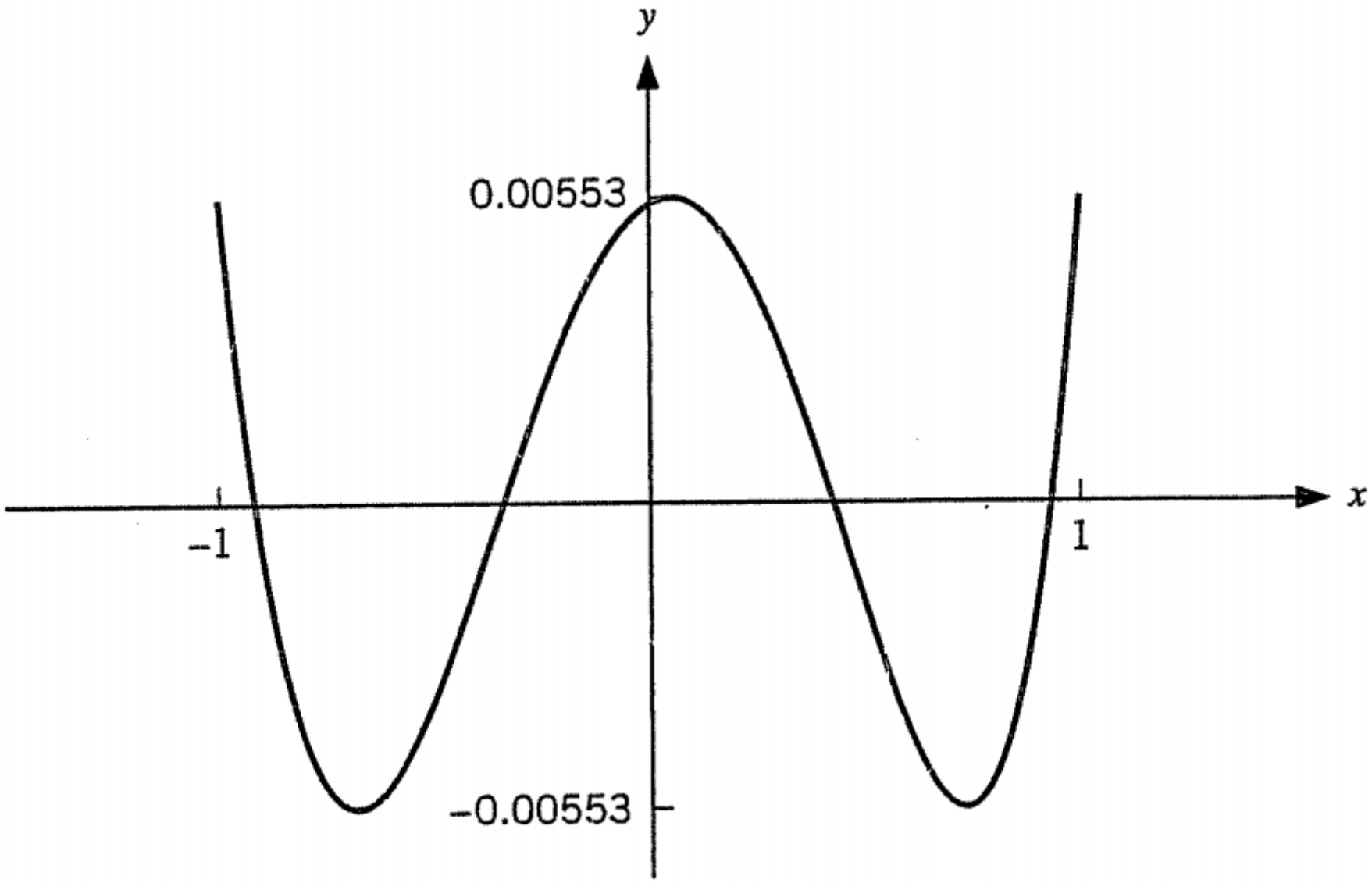


**Figure 4.14.** $e^x - m_3(x)$

| $n$ | Bound (4.82) | $\rho_n(f)$ |
|---|---|---|
| 1 | 6.80E − 1 | 2.79E − 1 |
| 2 | 1.13E − 1 | 4.50E − 2 |
| 3 | 1.42E − 2 | 5.53E − 3 |
| 4 | 1.42E − 3 | 5.47E − 4 |
| 5 | 1.18E − 4 | 4.52E − 5 |
| 6 | 8.43E − 6 | 3.21E − 6 |
| 7 | 5.27E − 7 | 2.00E − 7 |

**Table 4.6.** Bound on $\rho_n(e^x)$