Example 6.5.2. Use a computer with four digit floating-point decimal arithmetic with rounding, and use Gaussian elimination with pivoting. The system to be solved is

$$\begin{aligned} x_1 &+ 0.5x_2 &+ 0.3333x_3 &= 1 \\ 0.5x_1 &+ 0.3333x_2 &+ 0.25x_3 &= 0 \\ 0.3333x_1 &+ 0.25x_2 &+ 0.2x_3 &= 0 \end{aligned} \tag{6.85}$$

Then

$$\begin{aligned} x^{(0)} &= [8.968,\ -35.77,\ 29.77]^T \\ r^{(0)} &= [-0.005341,\ -0.004359,\ -0.0005344]^T \\ \hat{e}^{(0)} &= [0.09216,\ -0.5442,\ 0.5239]^T \\ x^{(1)} &= [9.060,\ -36.31,\ 30.29] \\ r^{(1)} &= [-0.0006570,\ -0.0003770,\ -0.0001980]^T \\ \hat{e}^{(2)} &= [0.001707,\ -0.01300,\ 0.01241]^T \\ x^{(2)} &= [9.062,\ -36.32,\ 30.30]^T \end{aligned}$$

The iterate $x^{(2)}$ is the correctly rounded solution of the system (6.85). This illustrates the usefulness of the residual correction method.