

Aufgabe 1

$$f(x) = e^{x^2} + x^{-3} - 10 = 0$$

$$f'(x) = 2xe^{x^2} - 3x^{-4}$$

Newton:

$$x_0 = 2$$

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$$

$$= x_n - \frac{e^{x^2} + x^{-3} - 10}{2xe^{x^2} - 3x^{-4}}$$

$$\hookrightarrow x_0 = 2$$

$$x_1 = 1.7950$$

$$x_2 = 1.6250$$

$$x_3 = 1.5307$$

$$x_4 = 1.5086 \rightarrow \text{Nullstelle}$$

Vereinfachter Newton

$$x_0 = 0.5$$

$$x_{n+1} = x_n - \frac{f(x_n)}{f'(x_0)}$$

$$x_{n+1} = x_n - \frac{e^{x^2} + x^{-3} - 10}{-46.716}$$

$$x_0 = 0.5$$

$$x_1 = 0.4847$$

$$x_2 = 0.4857$$

$$x_3 = 0.4856$$

$$x_4 = 0.4856 \rightarrow \text{Nullstelle}$$

Sekante:

$$x_0 = -1.0, x_1 = -1.2$$

$$x_{n+1} = x_n - \frac{x_n - x_{n-1}}{f(x_n) - f(x_{n-1})} \cdot f(x_n)$$

$$x_0 = -1.0$$

$$x_1 = -1.2$$

$$x_2 = -1.8610$$

$$x_3 = -1.3494$$

$$x_4 = -1.4326$$

$$x_5 = -1.5594 \rightarrow \text{Nullstelle}$$