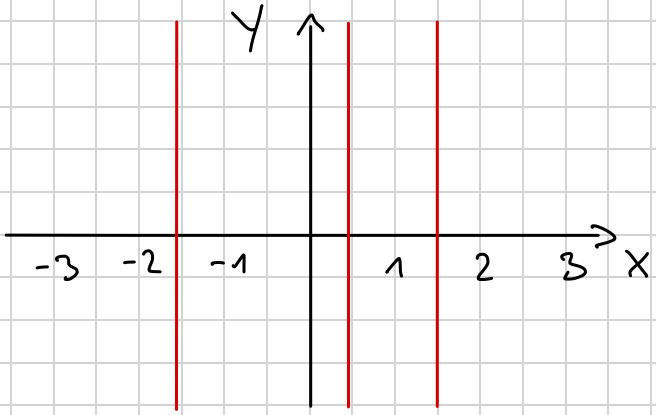
# Aufgabe 1




## Newton-Verfahren

$x_0 = 2$

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

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

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

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

| n | $x_n$ |
|---|---|
| 0 | 2.000 |
| 1 | 1.7950 |
| 2 | 1.62505 |
| 3 | 1.53076 |
| 4 | 1.50863 |

Nullstelle $x_n = 1.50863$

## Vereinfachter Newton

$x_0 = 0.5$

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

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

$f'(0.5) = \ldots -46.716$

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

| n | $x_n$ |
|---|---|
| 0 | 0.5000 |
| 1 | 0.4847 |
| 2 | 0.4857 |
| 3 | 0.4856 |
| 4 | 0.4856 |

Nullstelle $\overline{x_2} = 0.4856$

## Sekanten-Verfahren

$x_0 = -1.0 \qquad x_1 = -1.2$

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

| n | $x_n$ |
|---|---|
| 0 | -1.0000 |
| 1 | -1.2000 |
| 2 | -1.8610 |
| 3 | -1.3494 |
| 4 | -1.4326 |
| 5 | -1.5594 |

4. Iteration ↘

Nullstelle $x_3 = -1.5594$