Zentraler Differenzenquotient

$$f(x_0+h) = f(x_0) + f'(x_0)\cdot h + \frac{1}{2} f''(x_0) h^2 + \frac{1}{6} f'''(x_0) h^3 + \dots$$

$$f(x_0-h) = f(x_0) - f'(x_0)\cdot h + \frac{1}{2} f''(x_0) h^2 - \frac{1}{6} f'''(x_0) h^3 + \dots$$

$$f(x_0+h) - f(x_0-h) = \cancel{f(x_0)} + f'(x_0)\cdot h + \cancel{\frac{1}{2} f''(x_0) h^2} + \frac{1}{6} f'''(x_0) h^3 + \dots$$
$$- \left(\cancel{f(x_0)} - f'(x_0)\cdot h + \cancel{\frac{1}{2} f''(x_0) h^2} - \frac{1}{6} f'''(x_0) h^3 + \dots \right)$$

$$\Rightarrow f(x_0+h) - f(x_0-h) = f'(x_0)\cdot 2h + \frac{1}{3} f'''(x_0) h^3 + \dots \quad | : (2h)$$

$$\Rightarrow \frac{f(x_0+h) - f(x_0-h)}{2h} = f'(x_0) + \frac{1}{6} f'''(x_0) h^2 + \dots$$

der zent. Diff Quot hat 2. Ordnung!