# 1 Teori

Taylors formel med restledd:

$$R_5(x) = \frac{f^{(6)}(c)}{6!}(x - x_0)^6$$

$$EIy'''' = f(x)$$

$$y''''(x) \approx \frac{y(x-2h) - 4y(x-h) + 6y(x) - 4y(x+h) + y(x+2h)}{h^4}$$

# 2 Oppgaveløsing

1.

$$f(x+2h) = f(x)+2hf'(x)+2h^2f''(x)+\frac{4}{3}h^3f'''(x)+\frac{2}{3}n^4f''''(x)+O(n^6)$$

$$f(x-2h) = f(x)-2hf'(x)+2h^2f''(x)-\frac{4}{3}h^3f'''(x)+\frac{2}{3}n^4f''''(x)+O(n^6)$$

$$f(x+h) = f(x)+hf'(x)+\frac{1}{2}h^2f''(x)+\frac{1}{6}h^3f'''(x)+\frac{2}{3}n^4f''''(x)+O(n^6)$$

$$f(x-h) = f(x)-hf'(x)+\frac{1}{2}h^2f''(x)-\frac{1}{6}h^3f'''(x)+\frac{2}{3}n^4f''''(x)+O(n^6)$$

2.

$$f(x+h) + f(x-h) + f(x+2h) + f(x-2h)$$

3.

$$4f(x) + 5h^2f'''(x) + \frac{17}{12}h^4f''''(x)$$

4.

$$f''(x)h = f(x-h) + f(x+h)$$

$$= f(x) + hf'(x) + \frac{1}{2}h^2f''(x) + f(x) - hf'(x) + \frac{1}{2}h^2f''(x)$$

$$= 2f(x) + h^2f''(x) + \frac{1}{2}h^4f''''(x)$$

$$
\begin{aligned}
h^2 f''(x) &= 2f(x) - \frac{1}{12}h^4 f''''(x) + f(x-h) + f(x+h) \\
&= 4f(x) + 5(-2f(x) - \frac{1}{12}h^4 f''''(x)) + \frac{17}{12}h^4 f''''(x) \\
&= 4f(x) - 10f(x) - \frac{5}{12}h^4 f''''(x) + \frac{17}{12}h^4 f''''(x) \\
&= -6f(x) + h^4 f''''(x) + 5f(x-h) + 5f(x+h)
\end{aligned}
$$

5.

$$f(x-2h)+f(x-h)+f(x+h)+f(x+2h)+6f(x)-5f(x-h)-5f(x+h)$$