Formler i numerikk

- La $p(x)$ være et polynom av grad $\leq n$ som interpolerer $f(x)$ i punktene x_i, $i = 0,1,..,n$.
  Forutsatt at x og alle nodene ligger i intervallet $[a,b]$, så gjelder

$$f(x) - p(x) = \frac{1}{(n+1)!} f^{(n+1)}(\xi) \prod_{i=0}^{n} (x - x_i)$$

for en $\xi \in [a,b]$.

- Simpsons integrasjonsformel:

$$\int_{x_0}^{x_2} f(x)\,dx \approx \frac{h}{3}(f_0 + 4f_1 + f_2).$$

- Newtons metode for ligningssystemet $\vec{f}(\vec{x}) = \vec{0}$ er gitt ved

$$J^{(k)}\left(\Delta\vec{x}^{(k)}\right) = -\vec{f}\left(\vec{x}^{(k)}\right),$$

$$\vec{x}^{(k+1)} = \vec{x}^{(k)} + \Delta\vec{x}^{(k)}.$$

- Iterative teknikker for løsning av et lineært ligningssystem

$$\sum_{j=1}^{n} a_{ij} x_j = b_i \,,\; i = 1,2,...,n.$$

Jacobi: $$x_i^{(k+1)} = \frac{1}{a_{ii}}\left(b_i - \sum_{j=1}^{i-1} a_{ij} x_j^{(k)} - \sum_{j=i+1}^{n} a_{ij} x_j^{(k)}\right),$$

Gauss-Seidel: $$x_i^{(k+1)} = \frac{1}{a_{ii}}\left(b_i - \sum_{j=1}^{i-1} a_{ij} x_j^{(k+1)} - \sum_{j=i+1}^{n} a_{ij} x_j^{(k)}\right).$$

- Heuns metode for løsning av $\vec{y}' = \vec{f}(x, \vec{y})$:

$$\vec{k}_1 = h\vec{f}(x_n, \vec{y}_n),$$

$$\vec{k}_2 = h\vec{f}\left(x_n + h, \vec{y}_n + \vec{k}_1\right),$$

$$\vec{y}_{n+1} = \vec{y}_n + \frac{1}{2}\left(\vec{k}_1 + \vec{k}_2\right).$$

Tabell over noen Fourier-transformasjoner

$f(x)$	$\hat{f}(w) = F(f) = \frac{1}{\sqrt{2\pi}} \int\limits_{-\infty}^{\infty} f(x) e^{-iwx} dx$
$g(x) = f(ax)$	$\hat{g}(w) = \frac{1}{a} \hat{f}\left(\frac{w}{a}\right)$
$u(x) - u(x-a)$	$\frac{1}{\sqrt{2\pi}} \left(\frac{\sin aw}{w} - i \frac{1 - \cos aw}{w} \right)$
$u(x) e^{-x}$	$\frac{1}{\sqrt{2\pi}} \left(\frac{1}{1+w^2} - i \frac{w}{1+w^2} \right)$
e^{-ax^2}	$\frac{1}{\sqrt{2a}} e^{-\frac{w^2}{4a}}$
$e^{-a\|x\|}$	$\sqrt{\frac{2}{\pi}} \frac{a}{w^2 + a^2}$