

Lektion 2 - Opgave 4 (bag opg. 19.2.a)

- skitser funktionen, f

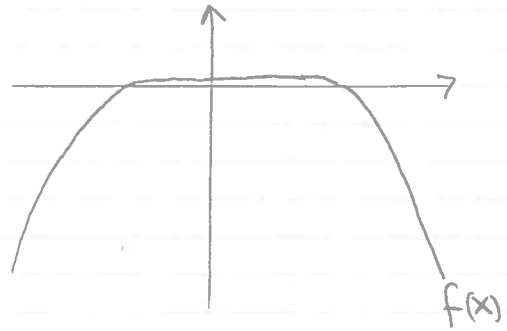
$$f(x) = 1 - \frac{1}{4}x^2 + \frac{1}{64}x^4 - \frac{1}{2304}x^6$$

Divider $f(x) = 0$ m/ $\frac{1}{4}x$

$$\frac{0}{\frac{1}{4}x} = \frac{1 - \frac{1}{4}x^2 + \frac{1}{64}x^4 - \frac{1}{2304}x^6}{\frac{1}{4}x}$$

$$0 = \frac{4}{x} - x + \frac{x^3}{16} - \frac{x^5}{576}$$

$$\underline{\underline{x = \frac{4}{x} + \frac{x^3}{16} - \frac{x^5}{576} = g(x)}}$$



nulpunkt nær $x=2$

Iterations metoder

Fikspunktiteration: $x_{n+1} = g(x)$

$$x_0 = 2$$

$$x_1 = g(2) = \frac{4}{2} + \frac{2^3}{16} - \frac{2^5}{576} = 2,4444$$

$$x_2 = g(x_1) = \frac{4}{2,4444} + \frac{2,4444^3}{16} - \frac{2,4444^5}{576} = 2,3977$$

$$x_3 = g(x_2) = \frac{4}{2,3977} + \frac{2,3977^3}{16} - \frac{2,3977^5}{576} = 2,3922$$

$$x_4 = g(x_3) = \frac{4}{2,3922} + \frac{2,3922^3}{16} - \frac{2,3922^5}{576} = 2,3917$$

$$x_5 = g(x_4) = \frac{4}{2,3917} + \frac{2,3917^3}{16} - \frac{2,3917^5}{576} = 2,3917$$

Newton's-Metode

$$f(x) = 1 - \frac{1}{4}x^2 + \frac{1}{64}x^4 - \frac{1}{2304}x^6$$

$$f'(x) = -\frac{1}{2}x + \frac{1}{16}x^3 - \frac{1}{384}x^5$$

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

$$x_0 = 2$$

$$x_1 = x_0 - \frac{f(x_0)}{f'(x_0)} = 2,380952381$$

$$x_2 = 2,391631493$$

$$x_3 = 2,391646691$$

$$x_4 = 2,391646691$$

udregninger
se sidste side

Sekant - metoden

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

$$x_0 = 2$$

$$x_1 = x_0 - f(x_0) \frac{x_0 - x_{-1}}{f(x_0) - f(x_{-1})} = 3,22781775$$

$$x_2 = x_1 - f(x_1) \frac{x_1 - x_0}{f(x_1) - f(x_0)} = 2,30647433$$

$$x_3 = x_2 - f(x_2) \frac{x_2 - x_1}{f(x_2) - f(x_1)} = 2,39176983$$

$$x_4 = 2,39165164$$

$$x_5 = 2,39164619$$

$$x_6 = 2,39164675$$

$$x_7 = 2,39164671$$

$$x_8 = 2,39164671$$

udregninger
se sidste side

Newton's-metode

| x_n | $f(x_n)$ | $f'(x_n)$ | $x_n - (f(x_n)/f'(x_n))$ |
|-------------|-------------|--------------|--------------------------|
| 2 | 0,222222222 | -0,583333333 | 2,380952381 |
| 2,380952381 | 0,005832352 | -0,546145794 | 2,391631493 |
| 2,391631493 | 8,27659E-06 | -0,544592185 | 2,391646691 |
| 2,391646691 | 1,6916E-11 | -0,544589959 | 2,391646691 |

Sekant-metode

| x_n | $f(x_n)$ | n | x_{n-1} | $f(x_{n-1})$ | $x_n - f(x_n) * ((x_n - x_{n-1}) / (f(x_n) - f(x_{n-1})))$ |
|-------------|--------------|-----|-----------|--------------|------------------------------------------------------------|
| 2 | 0,222222222 | 0 | -1 | 0,7651910 | 3,22781775 |
| 3,227817746 | -0,399459642 | 1 | 0 | 1,0000000 | 2,30647433 |
| 2,3064743 | 0,046895216 | 2 | 1 | 0,7651910 | 2,39176983 |
| 2,3917698 | -6,70619E-05 | 3 | 2 | 0,2222222 | 2,39165164 |
| 2,3916516 | -2,6968E-06 | 4 | 3 | -0,3007813 | 2,39164619 |
| 2,3916462 | 2,73659E-07 | 5 | 4 | -0,7777778 | 2,39164675 |
| 2,3916468 | -3,45216E-08 | 6 | 5 | -2,2660590 | 2,39164671 |
| 2,3916467 | -1,28817E-08 | 7 | 6 | -8,0000000 | 2,39164671 |