Mathematische Methoden
Aufgabenblatt 8

Finn Wagner

1) a) $x_0 = 0$

Sinus: $f(x) = \sin(x)$

$a_0 = f(0)/0! = \sin(0) = 0$

$f^{(1)}(x) = \cos(x) \Rightarrow a_1 = \frac{1}{1!}\cos(0) = 1$

$f^{(2)}(x) = -\sin(x) \Rightarrow a_2 = \frac{1}{2!}(-\sin(0)) = 0$

$f^{(3)}(x) = -\cos(x) \Rightarrow a_3 = \frac{1}{3!}(-\cos(0)) = -\frac{1}{6}$

$f^{(4)}(x) = \sin(x) \Rightarrow a_4 = \frac{1}{4!}(\sin(0)) = 0$

$f^{(5)}(x) = \cos(x) \Rightarrow a_5 = \frac{1}{5!}(\cos(0)) = \frac{1}{120}$

$f^{(6)}(x) = -\sin(x) \Rightarrow a_6 = \frac{1}{6!}(-\sin(0)) = 0$

Es ergibt sich das Taylorpolynom:

$$\Rightarrow f(x) \approx x - \frac{1}{6}x^3 + \frac{1}{120}x^5$$

Kosinus: $g(x) = \cos(x)$

$g^{(0)}(x) = \cos(x) \Rightarrow a_0 = \frac{1}{0!}\cos(0) = 1$

$g^{(1)}(x) = -\sin(x) \Rightarrow a_1 = \frac{1}{1!}(-\sin(0)) = 0$

$g^{(2)}(x) = -\cos(x) \Rightarrow a_2 = \frac{1}{2!}(-\cos(0)) = -\frac{1}{2}$

$g^{(3)}(x) = \sin(x) \Rightarrow a_3 = \frac{1}{3!}\sin(0) = 0$

$g^{(4)}(x) = \cos(x) \Rightarrow a_4 = \frac{1}{4!}\cos(0) = \frac{1}{24}$

$g^{(5)}(x) = -\sin(x) \Rightarrow a_5 = \frac{1}{5!}(-\sin(0)) = 0$

$g^{(6)}(x) = -\cos(x) \Rightarrow a_6 = \frac{1}{6!}(-\cos(0)) = -\frac{1}{720}$

Es ergibt sich das Taylorpolynom:

$$g(x) \approx 1 - \frac{1}{2}x^2 + \frac{1}{24}x^4 - \frac{1}{720}x^6$$