# ALA 09 (HA) zum 20.06.2013

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**1.** (a)

$$
\begin{aligned}
T_8(x) &= T_9(x) &&= 1 - \tfrac{x^2}{2!} + \tfrac{x^4}{4!} - \tfrac{x^6}{6!} + \tfrac{x^8}{8!} \\
T_{10}(x) &= T_{11}(x) &&= 1 - \tfrac{x^2}{2!} + \tfrac{x^4}{4!} - \tfrac{x^6}{6!} + \tfrac{x^8}{8!} - \tfrac{x^{10}}{10!} \\
T_{12}(x) &= T_{13}(x) &&= 1 - \tfrac{x^2}{2!} + \tfrac{x^4}{4!} - \tfrac{x^6}{6!} + \tfrac{x^8}{8!} - \tfrac{x^{10}}{10!} + \tfrac{x^{12}}{12!}
\end{aligned}
$$

$$
\begin{aligned}
T_9(1) &= \tfrac{1}{1} - \tfrac{1}{2!} + \tfrac{1}{4!} - \tfrac{1}{6!} + \tfrac{1}{8!} &&= \tfrac{4357}{8064} &&\approx 0.540302579365 \\
T_{11}(1) &= \tfrac{1}{1} - \tfrac{1}{2!} + \tfrac{1}{4!} - \tfrac{1}{6!} + \tfrac{1}{8!} - \tfrac{1}{10!} &&= \tfrac{1960649}{3628800} &&\approx 0.540302303791 \\
T_{13}(1) &= \cdots &&= \cdots &&\approx 0.540302305879
\end{aligned}
$$

(b) Taylorpolynome für $f(x)$ und $g(x)$ an $x_0 = 0$:

$$
\begin{aligned}
f(x) &= \sqrt{1+x} & g(x) &= \tfrac{1}{\sqrt[3]{1+x}} \\
T_0(x) &= 1 & T_0(x) &= 1 \\
T_1(x) &= 1 + \tfrac{x}{2} & T_1(x) &= 1 - \tfrac{x}{3} \\
T_2(x) &= 1 + \tfrac{x}{2} - \tfrac{x^2}{4\cdot 2!} & T_2(x) &= 1 - \tfrac{x}{3} + \tfrac{4x^2}{9\cdot 2!} \\
T_3(x) &= 1 + \tfrac{x}{2} - \tfrac{x^2}{4\cdot 2!} + \tfrac{x^3}{2\cdot 3!} & T_3(x) &= 1 - \tfrac{x}{3} + \tfrac{4x^2}{9\cdot 2!} - \tfrac{28x^3}{27\cdot 3!} \\
T_4(x) &= 1 + \tfrac{x}{2} - \tfrac{x^2}{4\cdot 2!} + \tfrac{x^3}{2\cdot 3!} - \tfrac{5x^4}{4\cdot 4!} & T_4(x) &= 1 - \tfrac{x}{3} + \tfrac{4x^2}{9\cdot 2!} - \tfrac{28x^3}{27\cdot 3!} + \tfrac{280x^4}{81\cdot 4!}
\end{aligned}
$$

(c) Taylorpolynom für $f(x) = e^x \cdot \sin x$ an $x_0 = 0$:

$$T_5(x) = x + x^2 + \frac{x^3}{3} - \frac{x^4}{6} - \frac{x^5}{30}$$

**2.** (i)

(ii)

(iii)

(iv)

**3.** (a)

(b)

(c)

(d)

**4.** (a)

(b)

(c)