

### Aufgabe 9.1

$$\begin{aligned}
 (1) \quad & \int_{-\infty}^{\infty} \frac{1}{x^2 + 3x^2 + 2} dx \\
 &= \int_{-\infty}^{\infty} \frac{1}{(x-2)(x-1)} dx = \int_{-\infty}^{\infty} \frac{1}{x-2} dx - \int_{-\infty}^{\infty} \frac{1}{x-1} dx \\
 &= \left[ \ln|x-2| \right]_{-\infty}^{\infty} + \left[ \ln|x-2| \right]_2^{\infty} - \left[ \ln|x-1| \right]_{-\infty}^{\infty} - \left[ \ln|x-1| \right]_1^{\infty} \\
 &= \text{„Werte existieren nicht“}
 \end{aligned}$$

$$\begin{aligned}
 (2) \quad & \int_0^e x \ln(x) dx \\
 &= \lim_{z \rightarrow 0} \left( \left[ \frac{1}{2} x^2 \ln(x) \right]_z^e - \int_z^e \frac{1}{2} x^2 dx \right) \stackrel{\text{L.H.}}{=} \frac{1}{2} e^2
 \end{aligned}$$

$$\begin{aligned}
 (3) \quad & \int \frac{x^6}{x^4 + 3x^2 + 2} dx \\
 &= \int (x^2 - 3) \frac{7x^2 + 6}{x^4 + 3x^2 + 2} dx = \int \left[ (x^2 - 3) - \left( \frac{1}{x^2 + 1} \right) + \left( \frac{8}{x^2 + 2} \right) \right] dx \\
 &= \frac{1}{3} x^3 - 3x - \arctan(x) + 4\sqrt{2} \arctan\left(\frac{x}{\sqrt{2}}\right)
 \end{aligned}$$

Zu (1)

