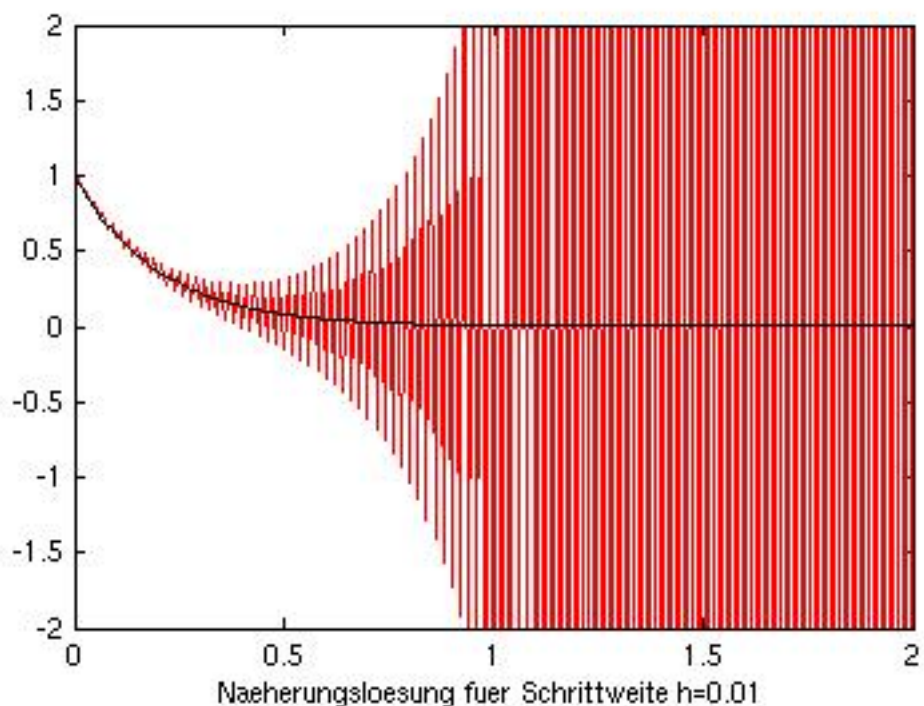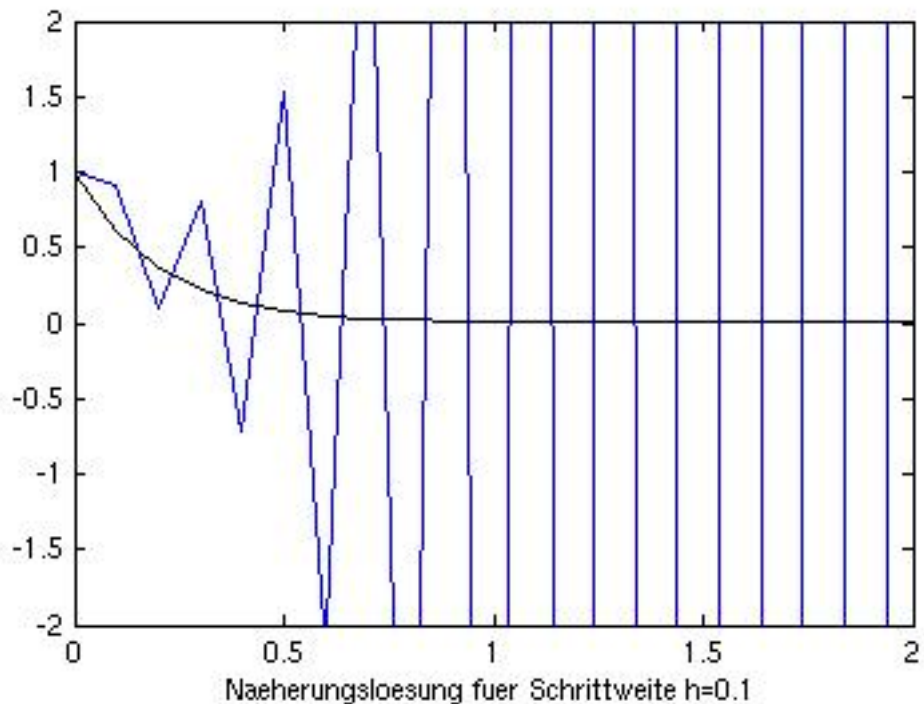## Testing a multistep method

We test the optimal stable explicit 2-step method, i.e.,

$$u_{j+2} - u_j = 2hf(t_{j+1}, u_{j+1}), \quad \text{(midpoint rule)},$$

for the IVP $y' = -5y$, $y(0) = 1$ with exact solution $y(t) = e^{-5t}$. Initial values: $u_0 = 1$ and $u_1 = e^{-5h}$. In the figure you can see the **exact solution** as well as the approximate solutions for **step-size** $h = 0.1$ and **step-size** $h = 0.01$.

Naeherungsloesung fuer Schrittweite h=0.1

Naeherungsloesung fuer Schrittweite h=0.01

Regions of absolute stability

Region of absolute stability for the explicit Euler method:
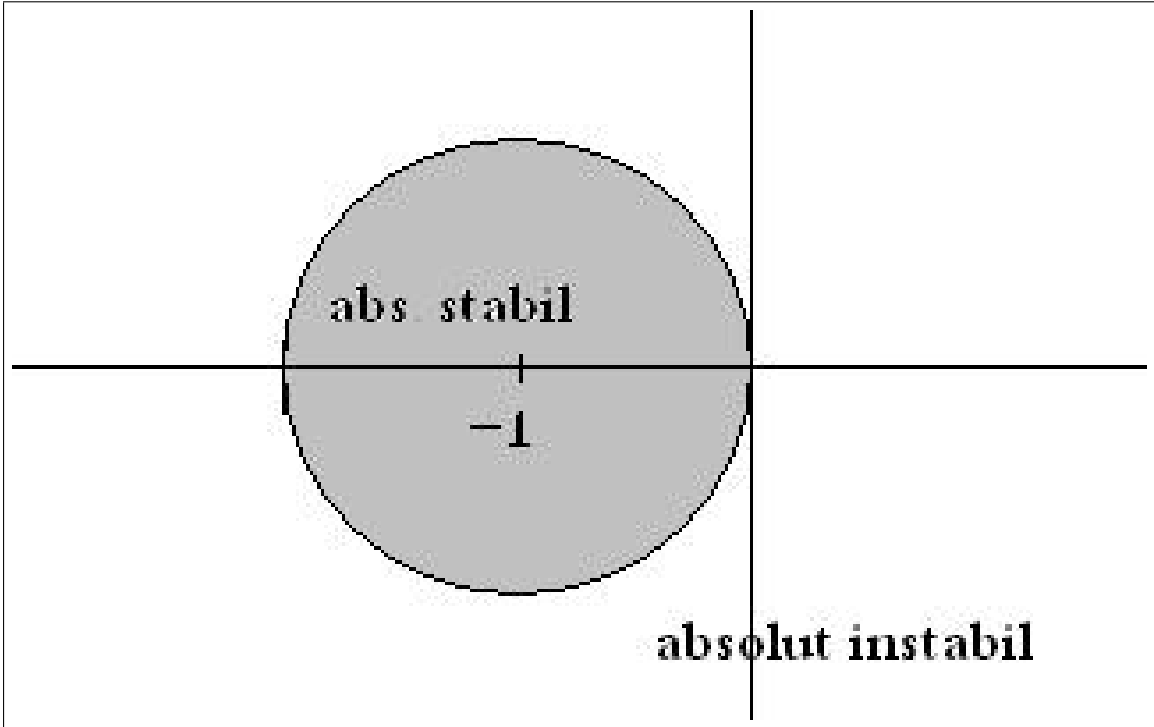
Region of absolute stability for the implicit Euler method: