

## ■ Laplace $g(t)=\cos[\omega t] E^{at}$

- Version  $\omega = 1$   $a = \frac{1}{5}$



Dazu mehrere ggb unser Buch Abschnitt 1.9.7 Weiterführung DGL 4.5.7

Laplace-cos-e-plusFuenftel-UR.ggb Laplace-cos-e-plusFuenftel-ZB.ggb Laplace-cos-e-plusFuenftel-CAS.ggb

Laplace-cos-e-plusFuenftel-DGL.ggb in 4.5.7

- konkrete Parameter

$$g[t_] := \text{Cos}[t] E^{\frac{t}{5}}$$

[Kosinus]

In[7]:=  $gs[t_] := g[t] E^{-s t}$  (\*Integrand\*)

In[8]:=  $Gs[t_] := \text{Integrate}[gs[t], t]$ ;  $Gs[t]$

[integriere]

Out[8]=  $\left( 5 e^{-\left(\frac{1}{5}+s\right) t} \left( \text{Cos}[t] - 5 s \text{Cos}[t] + 5 \text{Sin}[t] \right) \right) / \left( 26 - 10 s + 25 s^2 \right)$

In[10]:=  $G[s] = \text{Integrate}[gs[t], \{t, 0, \text{Infinity}\}]$

[integriere] [Unendlichkeit]

Out[10]=  $\text{ConditionalExpression}\left[\frac{-5 + 25 s}{26 + 5 s (-2 + 5 s)}, \text{Re}[s] > \frac{1}{5}\right]$

$$G[s] = \frac{-5 + 25 s}{26 + 5 s (-2 + 5 s)};$$

$$G1 = \frac{s - \frac{1}{5}}{1 + \left(s - \frac{1}{5}\right)^2};$$

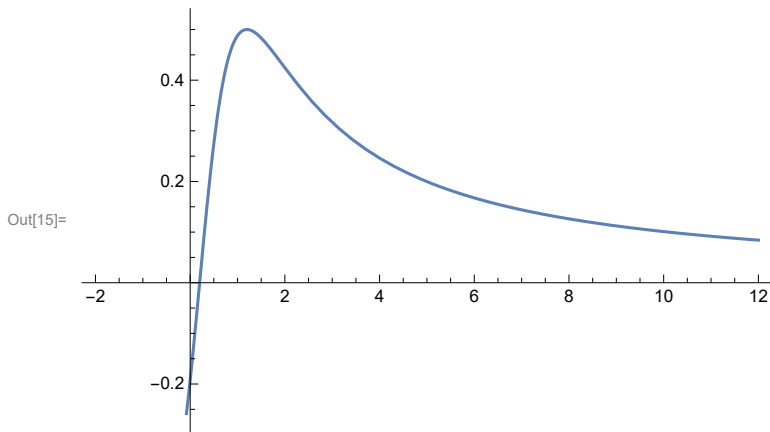
(\*Laplacetransformierte\*)

In[14]:=  $G[s] - G1 // \text{Simplify}$

[vereinfache]

Out[14]= 0

In[15]:= **Plot[G[s], {s, -2, 12}]**  
 [stelle Funktion graphisch dar]



## ● allgemeine Parameter

In[16]:= **g[t\_] := Cos[ω t] E<sup>a t</sup>**  
 [Kosinus]

In[17]:= **gs[t\_] := g[t] E<sup>-s t</sup> (\*Integrand\*)**

In[18]:= **Gs[t\_] := Integrate[gs[t], t]; Gs[t]**  
 [integriere]

Out[18]=  $(e^{(a-s)t} ((a-s) \cos[t \omega] + \omega \sin[t \omega])) / (a^2 - 2 a s + s^2 + \omega^2)$

In[19]:= **G[s] = Integrate[gs[t], {t, 0, Infinity}]**  
 [integriere] [Unendlichkeit]

Out[19]= **ConditionalExpression**  $\left[ \frac{-a + s}{(a - s)^2 + \omega^2}, \text{Re}[a] < \text{Re}[s] \ \&\& \ \text{Abs}[\text{Im}[\omega]] + \text{Re}[a] \leq \text{Re}[s] \right]$

$$G[s] = \frac{-a + s}{(a - s)^2 + \omega^2};$$

## ● Mit eingebauter Funktion für DGLn

## ● Hier

In[20]:= **LaplaceTransform[Cos[t] e<sup>1/5 t</sup>, t, s]**  
 [Laplace-Transformation] [Kosinus]

Out[20]=  $\frac{-\frac{1}{5} + s}{1 + \left(-\frac{1}{5} + s\right)^2}$

In[21]:= **InverseLaplaceTransform**  $\left[ \frac{-\frac{1}{5} + s}{1 + \left(-\frac{1}{5} + s\right)^2}, s, t \right]$  // **FullSimplify**  
 [inverse Laplace-Transformation] [vereinfache vollständig]

Out[21]=  $e^{t/5} \text{Cos}[t]$