

Lösungen Laplace-Transformationen

?*Laplace*

System`

InverseLaplaceTransform LaplaceTransform

?Laplace*

LaplaceTransform[expr, t, s] gives the Laplace transform of expr. LaplaceTransform[expr, {t1, t2, ... }, {s1, s2, ... }] gives the multidimensional Laplace transform of expr. Mehr...

In[45]:= ?InverseLaplace*

InverseLaplaceTransform[expr, s, t] gives the inverse Laplace transform of expr. InverseLaplaceTransform[expr, {s1, s2, ... }, {t1, t2, ... }] gives the multidimensional inverse Laplace transform of expr. Mehr...

1

a

LaplaceTransform[E^(2t-3), t, s]

$$\frac{1}{e^3 (-2 + s)}$$

b

t(t-1)(t-2)//Expand

$$2t - 3t^2 + t^3$$

LaplaceTransform[t(t-1)(t-2)+5, t, s]

$$\frac{6}{s^4} - \frac{6}{s^3} + \frac{2}{s^2} + \frac{5}{s}$$

c

LaplaceTransform[Cosh[t], t, s]

$$\frac{s}{-1 + s^2}$$

d

```
LaplaceTransform[Sinh[t],t,s]
```

$$\frac{1}{-1 + s^2}$$

e

```
LaplaceTransform[Cosh[t] Sinh[t],t,s]
```

$$\frac{1}{-4 + s^2}$$

f

```
LaplaceTransform[2Cosh[t] -Sinh[t],t,s]
```

$$-\frac{1}{-1 + s^2} + \frac{2s}{-1 + s^2}$$

g

```
LaplaceTransform[Cosh[3 t],t,s]
```

$$\frac{s}{-9 + s^2}$$

h

```
In[44]:= LaplaceTransform[3 Cos[4 t],t,s]
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```
Out[44]=  $\frac{3s}{16 + s^2}$ 
```

i

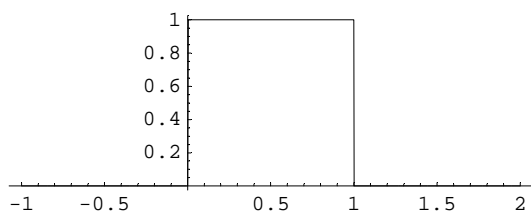
```
Remove[f]
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```
f[t_/; t < 0]:=0;
```

```
f[t_/; 0 <= t && t <= 1]:=1;
```

```
f[t_/; 1 < t]:=0;
```

```
Plot[f[t],{t,-1,2},AspectRatio->Automatic];
```



```
LaplaceTransform[f[t],t,s]
LaplaceTransform[f[t],t,s]
Integrate[e^(-s t) f[t],{t,0,10}]
```

$$\int_0^{10} e^{-s t} f[t] dt$$

```
Integrate[e^(-s t) 1,{t,0,1}]
```

$$\frac{1 - e^{-s}}{s \operatorname{Log}[e]}$$

j

```
D[E^(2t)*Cos[3 t]*Cosh[4 t],t]
```

$$2 e^{2t} \cos[3 t] \operatorname{Cosh}[4 t] - 3 e^{2t} \operatorname{Cosh}[4 t] \sin[3 t] + 4 e^{2t} \cos[3 t] \operatorname{Sinh}[4 t]$$

```
LaplaceTransform[E^(2t)*Cos[3 t]*Cosh[4 t],t,s]
```

$$\frac{6 + (-5 + s) (-1 + s) s}{(45 + (-12 + s) s) (13 + s (4 + s))}$$

```
% // ExpandAll // Together
```

$$\frac{6 + 5 s - 6 s^2 + s^3}{585 + 24 s + 10 s^2 - 8 s^3 + s^4}$$

k

```
LaplaceTransform[Evaluate[D[E^(2t)*Cos[3 t]*Cosh[4 t],t]],t,s]
```

$$\frac{16 (-7 + s) (3 + s)}{(45 + (-12 + s) s) (13 + s (4 + s))} - \frac{9 (29 + (-4 + s) s)}{(45 + (-12 + s) s) (13 + s (4 + s))} + \frac{2 (6 + (-5 + s) (-1 + s) s)}{(45 + (-12 + s) s) (13 + s (4 + s))}$$

```
% // Simplify
```

$$-\frac{585 + 18 s + 5 s^2 - 2 s^3}{585 + 24 s + 10 s^2 - 8 s^3 + s^4}$$