

1) Find the Laplace transform:

```
x = Cos[3 t];  
y = UnitStep[t];  
z = E^-2 t;  
LaplaceTransform[x * y * z, t, s]
```

$$\text{Out[39]= } \frac{2 + s}{13 + s (4 + s)}$$

2) Find the inverse Laplace transform:

```
In[45]:= a = \frac{2 s + 5}{s^2 + 25};  
InverseLaplaceTransform[a, s, t]
```

$$\text{Out[46]= } 2 \cos[5 t] + \sin[5 t]$$

3) Use Laplace transform to solve the differential equation:

```
In[84]:= de = v''[t] + 3 v'[t] + 2 v[t] == 5 E^-3 t;  
initial = {v[0] -> 2, v'[0] -> 0};  
L = LaplaceTransform[de, t, s];  
L = L /. initial;  
Solve[L, LaplaceTransform[v[t], t, s]];  
L = % // Last // Last // Last
```

$$\text{Out[89]= } \frac{23 + 12 s + 2 s^2}{(3 + s) (2 + 3 s + s^2)}$$