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>   # Maple Lab L2.1 details
>   # ============================
>   # maple integral table lookup
>   unassign('k','omega','t','x');
>   integrand:=(35-14*cos(omega*(x-3)))*k*exp(k*x-k*t);
>   integral:=int(integrand,x=0..t);
```

$integrand := (35 - 14 \cos(\omega (x - 3))) \, k e^{kx-kt}$

$integral := -7 \, \frac{5\,e^{-kt}k^2 + 5\,e^{-kt}\omega^2 - 2\,e^{-kt}k^2\cos(3\,\omega) + 2\,e^{-kt}k\omega\,\sin(3\,\omega) - 5\,k^2 - 5\,\omega^2 + 2\,k^2\cos(\omega t - 3\,\omega) + 2\,k\omega\,\sin(\omega t - 3\,\omega)}{k^2+\omega^2}$

```
>   # The homogenous solution is uh:=u0*exp(-k*t).  Superposition implies
>   # that the contribution from the homogeneous equation is
>   HomogSol:=-7*(5*exp(-k*t)*k^2+5*exp(-k*t)*omega^2-2*exp(-k*t)*k^2*cos(3*omega)+
>   2*exp(-k*t)*k*omega*sin(3*omega))/(k^2+omega^2);
>   # This answer is of the form u0*exp(-k*t) for some constant u0
```

$$HomogSol := -7\,\frac{5\,e^{-kt}k^2 + 5\,e^{-kt}\omega^2 - 2\,e^{-kt}k^2\cos(3\,\omega) + 2\,e^{-kt}k\omega\,\sin(3\,\omega)}{k^2+\omega^2}$$

```
>   # A particular solution consists of all other solution terms,
>   # obtained by removing the cited homogeneous solution "HomogSol."
>   up:=-7*(-5*k^2-5*omega^2+2*k^2*cos(omega*t-3*omega)+
>   2*k*omega*sin(omega*t-3*omega))/(k^2+omega^2);
```

$$up := -7\,\frac{-5\,k^2 - 5\,\omega^2 + 2\,k^2\cos(\omega t - 3\,\omega) + 2\,k\omega\,\sin(\omega t - 3\,\omega)}{k^2+\omega^2}$$

```
>   # The homogeneous solution uh is for arbitrary u0
>   uh:=u0*exp(-k*t);
```

$$uh := u0\,e^{-kt}$$

```
>   # The general solution is
>   u:=unapply(uh+up,(t,k,omega,u0));
```

$$u := (t,k,\omega,u0) \mapsto u0\,e^{-kt} - 7\,\frac{-5\,k^2 - 5\,\omega^2 + 2\,k^2\cos(\omega t - 3\,\omega) + 2\,k\omega\,\sin(\omega t - 3\,\omega)}{k^2+\omega^2}$$

```
>   # Maple L2.2 details
>   # ============================
>   # Superposition implies that the shortest expression for up is
>   # the one given above, therefore uss equals the up reported earlier:
>   uss:=unapply(up,(t,k,omega));
```

$$uss := (t,k,\omega) \mapsto -7\,\frac{-5\,k^2 - 5\,\omega^2 + 2\,k^2\cos(\omega t - 3\,\omega) + 2\,k\omega\,\sin(\omega t - 3\,\omega)}{k^2+\omega^2}$$