Oscillatory differential equation solution:

ky´´ + Ty´ + Ly = Tx

First, we solve homogeneous equation: ky´´ + Ty´ + Ly = 0.

We solve quadratic equation: kt2 + Tt + L = 0,

$$t\_{1,2}=\frac{-T\pm \sqrt{T^{2}-4kL}}{2k}$$

there are 3 cases for t1, t2.

1. t1 = t2 = t are both equal real numbers, $t=\frac{-T}{2k}$: $y\_{h}=C\_{1}e^{xt}+C\_{2}xe^{xt}$

2. t1 $\ne $ t2 are both different real numbers: $y\_{h}=C\_{1}e^{xt\_{1}}+C\_{2}e^{xt\_{2}}$

3. t1 $\ne $ t2 are both complex conjugate numbers: $y\_{h}=C\_{1}\cos(\left(ax\right)+C\_{2}\sin(\left(bx\right)))$, here a = t and $b=\frac{\sqrt{4kL-T^{2}}}{2k}$.

Now, for ky´´ + Ty´ + Ly = Tx

$y=y\_{h}+\frac{Tx}{L}-\frac{T^{2}}{L^{2}}$ for $L\ne 0$

$$y= y\_{h}+\frac{x^{2}}{2}-\frac{kx}{T} for L=0$$