The values of t,where the graph of the solution $x(t)=\frac{2}{3}\sqrt{10}e^{-t}\sin(3t+4.391)$ will meet the positive $t-$axis are given as follows;

$x(t)=\frac{2}{3}\sqrt{10}e^{-t}\sin(3t+4.391)=0$

$\Longrightarrow \sin(3t+4.391)=0 \qquad \because \frac{2}{3}\sqrt{10}e^{-t}\neq 0$

$\Longrightarrow 3t+4.391=n\pi, n\in\mathbb{Z}$

$\Longrightarrow 3t=n\pi-4.391 \Longrightarrow t=\frac{\pi}{3}n-\frac{4.391}{3}$

$\Longrightarrow t=(1.0472)\,n-1.4637$

Put $n=2,3,4,5....$(here it is to be noted that we did not put $n=1$,as this will give negative value of t which is of no interest)

$t_{\gamma_1}=(1.0472)(2)-1.4637=0.6307$

$t_{\gamma_2}=(1.0472)(3)-1.4637=1.6779$

$t_{\gamma_3}=(1.0472)(4)-1.4637=2.7251$

$t_{\gamma_4}=(1.0472)(5)-1.4637=3.7723$

These are the values of t_γ in the 2nd column of the table.

The values of t,where the graph of the solution $x(t)=\frac{2}{3}\sqrt{10}e^{-t}\sin(3t+4.391)$ will meet the graph of $\frac{2}{3}\sqrt{10}e^{-t}$ are given as follows;

$x(t)=\frac{2}{3}\sqrt{10}e^{-t}\sin(3t+4.391)=\frac{2}{3}\sqrt{10}e^{-t}$

$\Longrightarrow \sin(3t+4.391)=1$

$\Longrightarrow 3t+4.391=$ odd multiples of $\frac{\pi}{2}$

$\Longrightarrow 3t+4.391=(2k+1)\frac{\pi}{2}, k\in\mathbb{Z}$

$\Longrightarrow 3t=(2k+1)\frac{\pi}{2}-4.391=3.1416k-2.8202$

$\Longrightarrow t=\frac{3.1416}{3}k-\frac{2.8202}{3}$

$\Longrightarrow t=1.0472k-0.94007$

Put $n=1,2,3,4,5....$

$t^*_{\gamma_1}=1.0472(1)-0.94007=0.10713$

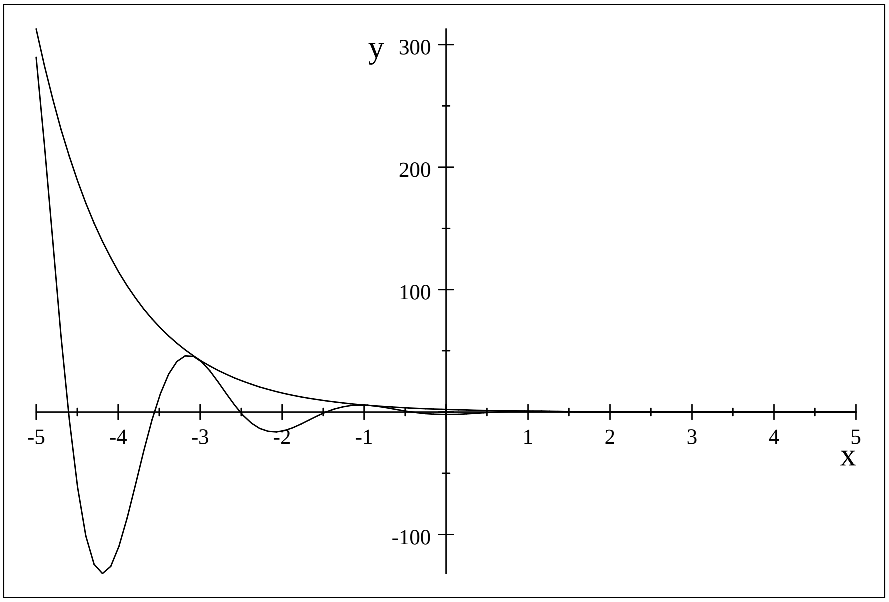
$t^*_{\gamma_2}=1.0472(2)-0.94007=1.1543$

$t^*_{\gamma_3}=1.0472(3)-0.94007=2.2015$

$t^*_{\gamma 4}=1.0472(4)-0.94007=3.2487$

$t^*_{\gamma 5}=1.0472(5)-0.94007=4.2959$

These are the values of t^*_γ in the 3rd column of the table.


y
300
200
100
-100
-5
-4
-3
-2
-1
1
2
3
4
5
x