Análisis de sistemas lineales.

"Tensión en los componentes de RLC y respuestas ante entradas básicas."

Tarea N^{0}4.

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Integrante:

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Componente.	Frecuencia.	Tiempo.
Capacitor	$\boldsymbol{V_c = \frac{I_{(s)}}{C * S}}$	$\boldsymbol{V_R = \frac{1}{C}\int_0^t Ic\, dt}$
Resistencia	$\boldsymbol{V_R = I_{(s)} * R}$	$\boldsymbol{V_R = i * R}$
Inductor	$\boldsymbol{V_L = L * S * I_{(s)}}$	$\boldsymbol{V_L = L \frac{di}{dt}}$

Las ecuaciones a utilizar serian:

Para la Resistencia:

$$\frac{V_R(s)}{V_{in}(s)} = \frac{S * R}{Ls^2 + Rs + \frac{1}{C}}$$

Para el Inductor:

$$\frac{V_L(s)}{V_{in}(s)} = \frac{s^2 * L}{Ls^2 + Rs + \frac{1}{C}}$$

Para el capacitor:

$$\frac{V_C(s)}{V_{in}(s)} = \frac{S * R}{CRs^2 + CL * s^3 + s}$$

Entradas a graficar

Impulso: 1

Escalón unitario: $\frac{1}{s}$

Rampa: $\frac{1}{s^2}$

Para impulso:

- Valor del Voltaje en la resistencia.

Input interpretation:

$$\mathcal{L}_s^{-1}\left[\frac{1\times 10^3\, s}{1\times 10^3\, s + 1\times 10^{-6}\, s^2 + \frac{1}{1\times 10^{-6}}}\right](t)$$

Open code

$\mathcal{L}_s^{-1}[f(s)](t)$ is the inverse Laplace transform of $f(s)$ with real variable t

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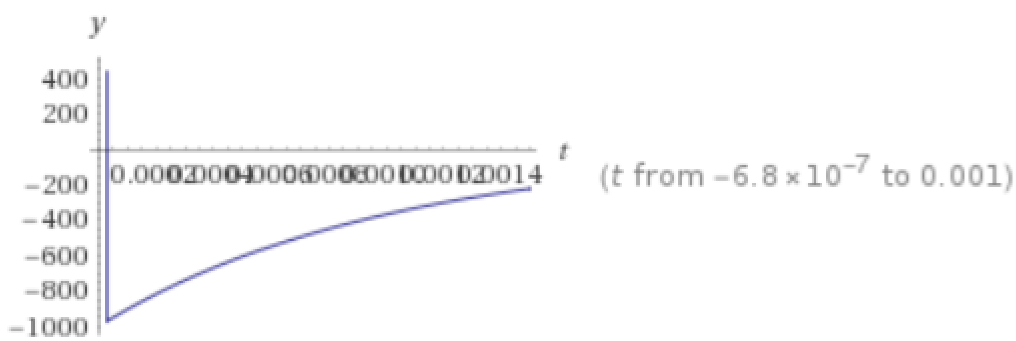
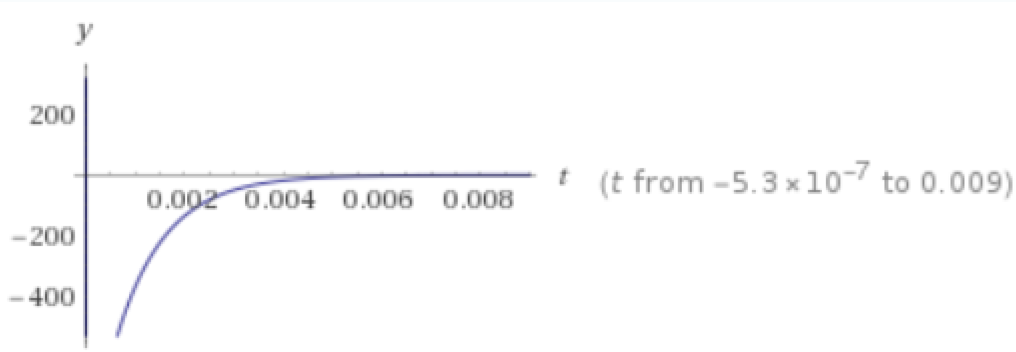
Result:

$$\left(500\,000\,000\, e^{-\frac{1\,000\,000\, t}{500+\sqrt{249\,999}}} \left(499\,999\, e^{\frac{1\,000\,000\, t}{500+\sqrt{249\,999}}+\left(-500\,000\,000-1\,000\,000\sqrt{249\,999}\right)t} + 1000\sqrt{249\,999}\, e^{\frac{1\,000\,000\, t}{500+\sqrt{249\,999}}+\left(-500\,000\,000-1\,000\,000\sqrt{249\,999}\right)t} - 1\right)\right) \Big/ \left(249\,999 + 500\sqrt{249\,999}\right)$$

Plots:





- Valor del Voltaje en el Inductor.

Input interpretation:

$$\mathcal{L}_s^{-1}\left[\frac{1\times 10^{-6}\, s^2}{1\times 10^{3}\, s + 1\times 10^{-6}\, s^2 + \frac{1}{1\times 10^{-6}}}\right](t)$$

Open code

$\mathcal{L}_s^{-1}[f(s)](t)$ is the inverse Laplace transform of $f(s)$ with real variable t

Result:

$$\frac{1}{1\,000\,000}\left(1\,000\,000\,\delta(t) - \left(500\,000\,000\,000\, e^{-\frac{1\,000\,000\, t}{500+\sqrt{249\,999}}} \left(499\,998\,500\, e^{\frac{1\,000\,000\, t}{500+\sqrt{249\,999}} + \left(-500\,000\,000 - 1\,000\,000\sqrt{249\,999}\right)t} + 999\,999\sqrt{249\,999}\, e^{\frac{1\,000\,000\, t}{500+\sqrt{249\,999}} + \left(-500\,000\,000 - 1\,000\,000\sqrt{249\,999}\right)t} - 500 + \sqrt{249\,999}\right)\right) \Big/ \left(249\,999 + 500\sqrt{249\,999}\right)\right)$$

- Valor del Voltaje en el capacitor.

Input interpretation:

$$\mathcal{L}_s^{-1}\left[\frac{s}{1\times 10^{-3}\, s^2 + 1\times 10^{-12}\, s^3 + s}\right](t)$$

Open code

$\mathcal{L}_s^{-1}[f(s)](t)$ is the inverse Laplace transform of $f(s)$ with real variable t

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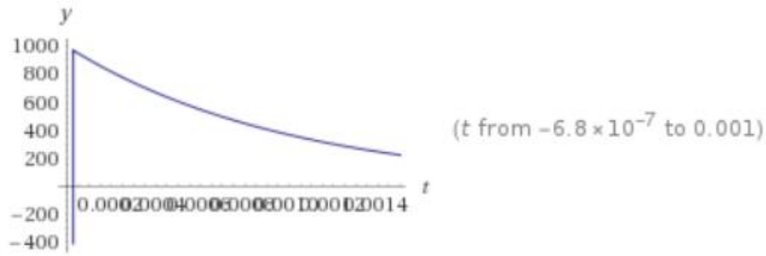
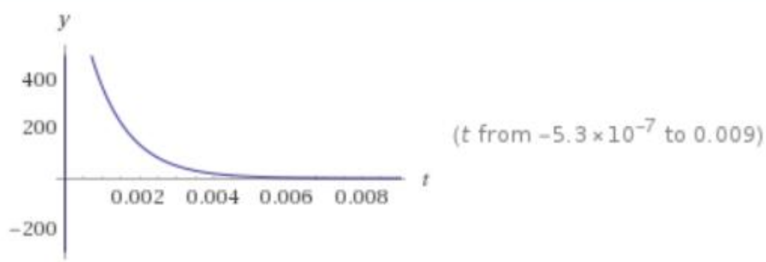
Result:

$$-\left(\left(500\,000\left(500 + \sqrt{249\,999}\right) e^{-\frac{1\,000\,000\, t}{500+\sqrt{249\,999}}} \left(e^{\frac{1\,000\,000\, t}{500+\sqrt{249\,999}} + \left(-500\,000\,000 - 1\,000\,000\sqrt{249\,999}\right)t} - 1\right)\right) \Big/ \left(249\,999 + 500\sqrt{249\,999}\right)\right)$$

Plots:





Para Rampa:

- Valor del Voltaje en la resistencia.

Input interpretation:

$$\mathcal{L}_s^{-1}\left[\frac{1\times 10^3\, s}{1\times 10^3\, s + 1\times 10^{-6}\, s^2 + \frac{1}{1\times 10^{-6}}} \times \frac{1}{s^2}\right](t)$$

Open code

$\mathcal{L}_s^{-1}[f(s)](t)$ is the inverse Laplace transform of $f(s)$ with real variable t

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Result:

$$1000\left(\frac{1}{1\,000\,000} - \left(e^{-\frac{1\,000\,000\, t}{500+\sqrt{249\,999}}}\left(-e^{\frac{1\,000\,000\, t}{500+\sqrt{249\,999}}+\left(-500\,000\,000-1\,000\,000\sqrt{249\,999}\right)t} + 499\,999 + 1000\sqrt{249\,999}\right)\right)\Big/\left(2\,000\,000\left(249\,999+500\sqrt{249\,999}\right)\right)\right)$$

- Valor del Voltaje en el Inductor.

Input interpretation:

$$\mathcal{L}_s^{-1}\left[\frac{1\times10^{-6}\,s^2}{1\times10^{3}\,s+1\times10^{-6}\,s^2+\frac{1}{1\times10^{-6}}}\times\frac{1}{s^2}\right](t)$$

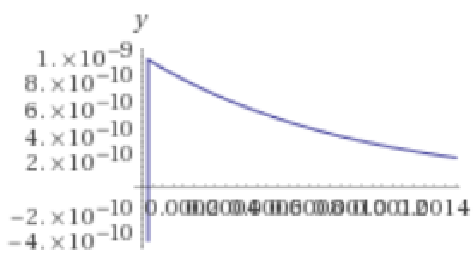
Open code

$\mathcal{L}_s^{-1}[f(s)](t)$ is the inverse Laplace transform of $f(s)$ with real variable t

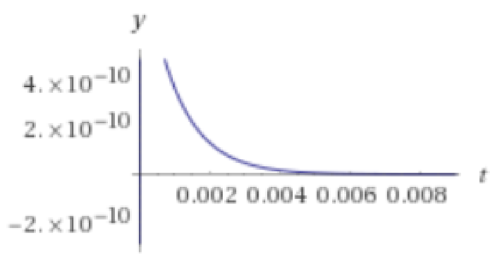
Result:

$$-\frac{\left(500+\sqrt{249\,999}\right)e^{-\frac{1\,000\,000\,t}{500+\sqrt{249\,999}}}\left(e^{\frac{1\,000\,000\,t}{500+\sqrt{249\,999}}+\left(-500\,000\,000-1\,000\,000\sqrt{249\,999}\right)t}-1\right)}{2\,000\,000\left(249\,999+500\sqrt{249\,999}\right)}$$

Plots:



(t from -7.3×10^{-7} to 0.001)



(t from -5.3×10^{-7} to 0.009)

- Valor del Voltaje en el capacitor.

Input interpretation:

$$\mathcal{L}_s^{-1}\left[\frac{s}{1\times 10^{-3}\,s^2+1\times 10^{-12}\,s^3+s}\times\frac{1}{s^2}\right](t)$$

Open code

$\mathcal{L}_s^{-1}[f(s)](t)$ is the inverse Laplace transform of $f(s)$ with real variable t

Result:

$$\left(e^{-\frac{1\,000\,000\,t}{500+\sqrt{249\,999}}}\left(-500\,e^{\frac{1\,000\,000\,t}{500+\sqrt{249\,999}}+\left(-500\,000\,000-1\,000\,000\sqrt{249\,999}\right)t}+\sqrt{249\,999}\,e^{\frac{1\,000\,000\,t}{500+\sqrt{249\,999}}+\left(-500\,000\,000-1\,000\,000\sqrt{249\,999}\right)t}+499\,998\,500+999\,999\sqrt{249\,999}\right)\right)\Big/\left(2\,000\,000\left(249\,999+500\sqrt{249\,999}\right)\right)+t-\frac{1}{1000}$$

<u>**Para Escalón:**</u>

- Valor del Voltaje en la resistencia.

Input interpretation:

$$\mathcal{L}_s^{-1}\left[\frac{1\times 10^{3}\,s}{1\times 10^{3}\,s+1\times 10^{-6}\,s^2+\frac{1}{1\times 10^{-6}}}\times\frac{1}{s}\right](t)$$

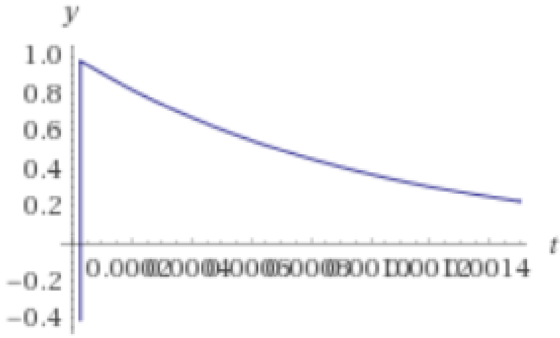
Open code

$\mathcal{L}_s^{-1}[f(s)](t)$ is the inverse Laplace transform of $f(s)$ with real variable t

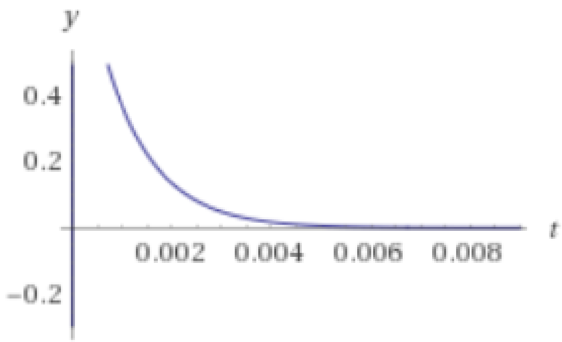
Result:

$$-\left(\left(500\left(500+\sqrt{249\,999}\right)e^{-\frac{1\,000\,000\,t}{500+\sqrt{249\,999}}}\left(e^{\frac{1\,000\,000\,t}{500+\sqrt{249\,999}}+\left(-500\,000\,000-1\,000\,000\sqrt{249\,999}\right)t}-1\right)\right)\Big/\left(249\,999+500\sqrt{249\,999}\right)\right)$$

Plots:



(t from -6.8×10^{-7} to 0.001)



(t from -5.3×10^{-7} to 0.009)

- Valor del Voltaje en el Inductor.

Assuming "s" is a variable | Use "s^2" as a unit instead

Input interpretation:

$$\mathcal{L}_s^{-1}\left[\frac{1\times10^{-6}\,s^2}{1\times10^3\,s+1\times10^{-6}\,s^2+\frac{1}{1\times10^{-6}}}\times\frac{1}{s}\right](t)$$

Open code

$\mathcal{L}_s^{-1}[f(s)](t)$ is the inverse Laplace transform of $f(s)$ with real variable t

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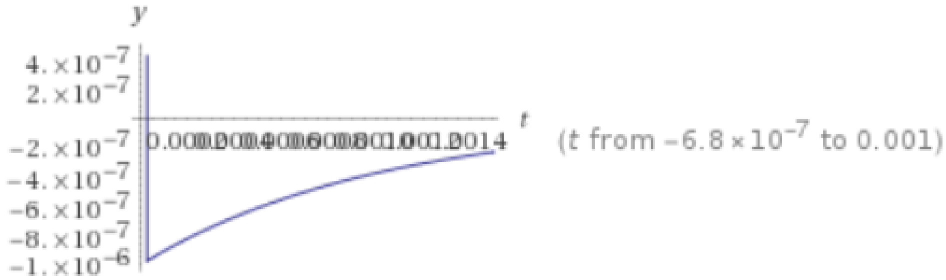
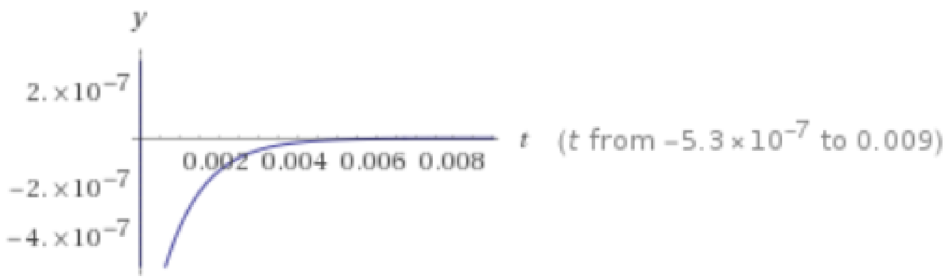
Result:

$$\left(e^{-\frac{1000000\,t}{500+\sqrt{249999}}}\left(499999\,e^{\frac{1000000\,t}{500+\sqrt{249999}}+\left(-500000000-1000000\sqrt{249999}\right)t}+1000\sqrt{249999}\,e^{\frac{1000000\,t}{500+\sqrt{249999}}+\left(-500000000-1000000\sqrt{249999}\right)t}-1\right)\right)\Big/\left(2\left(249999+500\sqrt{249999}\right)\right)$$

Plots:





- Valor del Voltaje en el capacitor.

Input interpretation:

$$\mathcal{L}_s^{-1}\left[\frac{s}{1\times 10^{-3}\, s^2 + 1\times 10^{-12}\, s^3 + s} \times \frac{1}{s}\right](t)$$

Open code

$\mathcal{L}_s^{-1}[f(s)](t)$ is the inverse Laplace transform of $f(s)$ with real variable t

Result:

$$1 - \left(e^{-\frac{1000000\, t}{500+\sqrt{249999}}} \left(-e^{\frac{1000000\, t}{500+\sqrt{249999}} + \left(-500000000 - 1000000\sqrt{249999}\right) t} + 499999 + 1000\sqrt{249999}\right)\right) \Big/ \left(2\left(249999 + 500\sqrt{249999}\right)\right)$$