In the frequency domain, using Fourier transform

\[ X(j\omega) = \frac{1}{1 + j\omega RC} \]

\[ H(j\omega) = \frac{Y(j\omega)}{X(j\omega)} = \frac{1}{1 + j\omega RC} \]

\[ \theta(j\omega) = -\tan^{-1}(\frac{\omega}{RC}) \]

Let's find \( y(t) \) for \( x(t) = E \delta(t) \)

\[ E = \mathcal{L}^{-1}\{Y(s)\} = \frac{E}{s} \]

\[ Y(s) = \frac{1}{s(RC + 1)} \]

\[ y(t) = \mathcal{L}^{-1}\{Y(s)\} = E(t - \frac{1}{RC}) \]

Thus, \( y(t) \) is a ramp function with a slope of \( \frac{E}{RC} \).

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HW is assigned for each week this week's HW assignment is:

HW is not collected or corrected. Each student is responsible to solve them correctly (using answers to be provided).

Following Monday, we will have a 15 min quiz - one problem chosen from the assigned HW problems (parameters may change but not problems).
\[ Z = a + j b \]

\[ M = \sqrt{a^2 + b^2} \]

\[ \theta = \tan^{-1} \frac{b}{a} \]

\[ e^{j \theta} = \cos \theta + j \sin \theta \]

\[ e^{-j \theta} = \cos \theta - j \sin \theta \]

\[ e^{j2\theta} + e^{-j2\theta} = 2 \cos 2\theta \]

Signal synthesis:

\[ x(t) = \frac{1}{1 + e^t} \]

\[ X(\xi) = \frac{\xi}{\xi^2 + \xi^2} \]

Continuous-time signals ↔ Discrete-time signals

(EE 153)
\[ \int_{-\infty}^{\infty} \frac{1}{1 + t^2} \, dt = \pi \]

\[ E = \int_{-\infty}^{\infty} \frac{1}{1 + t^2} \, dt - \lim_{t \to \infty} \frac{\tan^{-1} t}{t} \]

\[ = \left[ \frac{\pi}{2} - \left( \frac{\pi}{2} \right) \right] = \frac{\pi}{1} \]

For a given signal \( x(t) \)

\[ x_e(t) = \frac{1}{2} [x(t) + x(-t)] \]

\[ x_o(t) = \frac{1}{2} [x(t) - x(-t)] \]

Properties

\[ x_e(t) = x_e(-t) \]

\[ x_o(t) = -x_o(-t) \]