

# 6.003: Signal Processing

## Continuous-Time Fourier Transform

### Synthesis Equation

$$x(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} X(\omega) e^{j\omega t} d\omega$$

### Analysis Equation

$$X(\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt$$

## Continuous-Time Fourier Transform

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Find the Fourier transforms of the following continuous-time signals.

- $x_1(t) = \begin{cases} e^{-t} & \text{if } t > 0 \\ 0 & \text{otherwise} \end{cases}$
- $x_2(t) = x_1(t - t_0)$
- $x_3(t) = \text{Symmetric}\{x_1(t)\}$
- $x_4(t) = \text{Antisymmetric}\{x_1(t)\}$
- $x_5(t) = \frac{d}{dt} \text{Symmetric}\{x_1(t)\}$

## Inverse Continuous-Time Fourier Transform

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Find the signal whose Fourier transform is

$$X(\omega) = e^{-|\omega|}$$