Assignment0

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My favorite equation is the Fourier transform equation of a function $f(t)$ to $f(\omega)$:

$$f(\omega) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{+\infty} f(t) e^{-\mathrm{i}\omega \mathrm{t}} dt \tag{1}$$

Fourier transform decomposes a signal that varies with time into continuous frequency components. This result of this equation, $f(\omega)$, describes the magnitude of each frequency component or how much of each frequency component is in the signal. For example, if a signal is described as a simple sinusoidal wave, like $f(t) = a_0 \cos(\omega_0 t)$, where a_0 is amplitude, then, the Fourier Transform of the signal will be a Dirac-Delta function that is a_0 at ω_0 and zero elsewhere because the signal has only one frequency component ω_0. If a signal is described as a constant function, then the Fourier Transform of it will be a Dirac-Delta function at 0. In reverse, the Fourier Transform of a Dirac-Delta function at 0 is a constant function. Fourier Transform has practical applications as well . If you are interested in filtering an audio signal that has high-frequency noise. You can do a Fourier Transform to clean up the components with high frequencies.