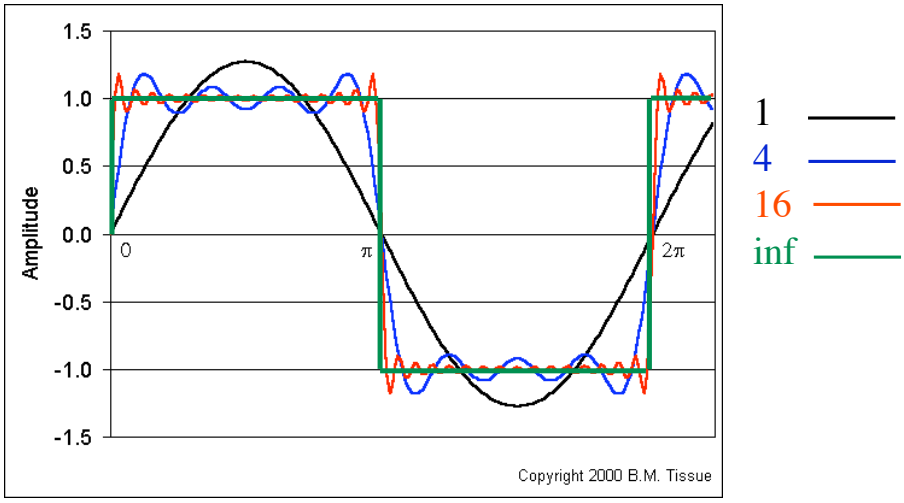
FT Spectroscopy

Any continuous function in time can be expressed as a combination of harmonics at various frequency.

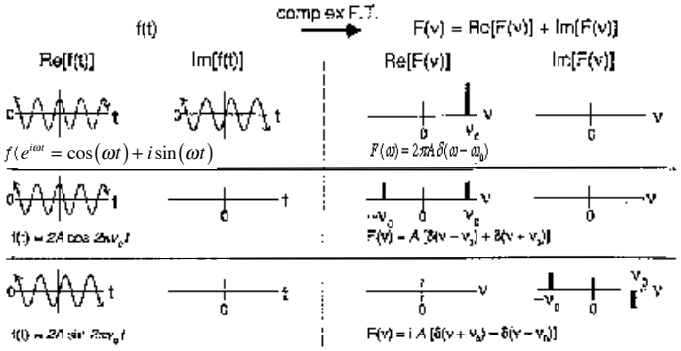


Adapted from http://www.chemicool.com/definition/fourier_transform.html

FT Spectroscopy

Any continuous function in time can be expressed as a combination of harmonics at various frequency. The function that describes the contribution of the oscillations to the continuous function is its Fourier transform -

The simplest examples are single frequency sine or cosine functions which have single-frequency FTs -

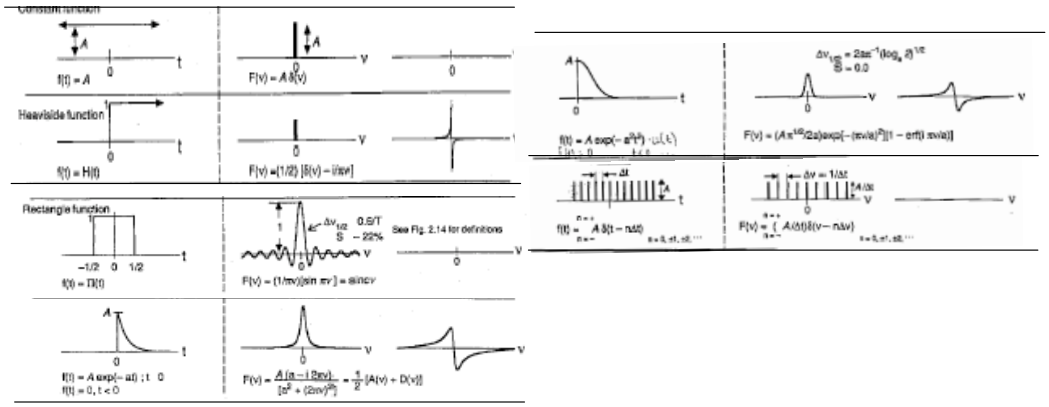


Marshall & Verdun, FT in NMR, Optical and Mass Spec, 1990.

FT Spectroscopy

The FT is a linear transformation, i.e.,

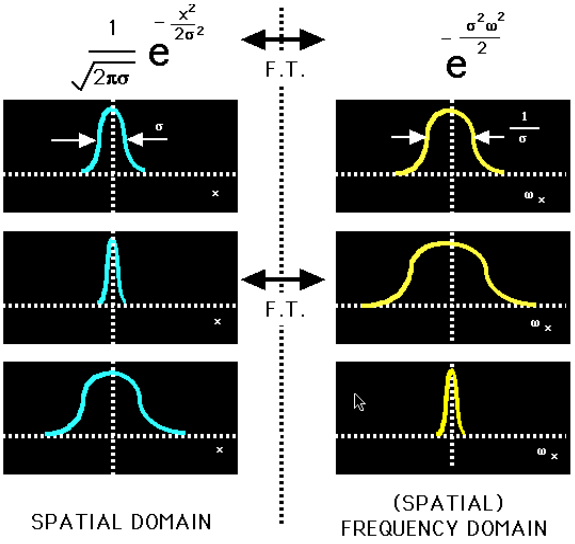
so if we collect a series of *library functions*, we can write the FT of any *NEW* function as a linear combination of the library functions -



Marshall & Verdun, FT in NMR, Optical and Mass Spec, 1990.

FT Spectroscopy

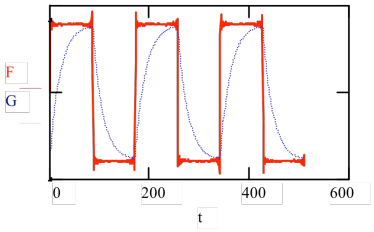
The Gaussian function is special, it is its own FT:



http://www.med.harvard.edu/JPNM/physics/didactics/improc/intrøfourier3.html

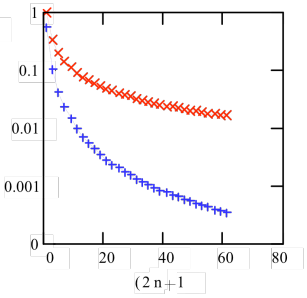
The wider the series the narrower the transform and vice versa.

FT Spectroscopy



Spectrum:

$\frac{1/(2n+1)}{[1+(\omega\tau)^2]^{1/2}}$



Phases:

$\operatorname{atan}(\omega\tau)$