

Fourier Transform Properties

1. $\hat{f}(\lambda) = \mathcal{F}[f](\lambda) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(t)e^{-it\lambda} dt.$
2. $\frac{f(t^+) + f(t^-)}{2} = \mathcal{F}^{-1}[\hat{f}](t) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} \hat{f}(\lambda)e^{it\lambda} d\lambda.$
3. $\mathcal{F}[t^n f(t)](\lambda) = i^n \frac{d^n \hat{f}}{d\lambda^n}.$
4. $\mathcal{F}\left[\frac{d^n f}{dt^n}\right](\lambda) = (i\lambda)^n \hat{f}(\lambda).$
5. $\mathcal{F}[f(bt - a)](\lambda) = \frac{1}{b} e^{-i(\lambda a)/b} \hat{f}(\lambda).$

Funtion	Fourier Transform
6. $f(t)$	$\hat{f}(\lambda)$
$\hat{f}(t)$	$f(-\lambda)$

Integrals

1. $\int e^{at} dt = \frac{1}{a} e^{at} + C$
2. $\int t e^{at} dt = \frac{1}{a} (t - 1) e^{at} + C$
3. $\int t \sin(at) dt = \frac{1}{a^2} (\sin(at) - at \cos(at)) + C$
4. $\int t \cos(at) dt = \frac{1}{a^2} (\cos(at) + at \sin(at)) + C$
5. $\int e^{at} \cos(bt) dt = \frac{e^{at}}{a^2 + b^2} (a \cos(bt) + b \sin(bt)) + C$
6. $\int e^{at} \sin(bt) dt = \frac{e^{at}}{a^2 + b^2} (a \sin(bt) - b \cos(bt)) + C$
7. $\int \cos(at) \cos(bt) dt = \frac{\sin((a+b)t)}{2(a+b)} + \frac{\sin((a-b)t)}{2(a-b)} + C, a \neq b$
8. $\int \cos^2(at) dt = \frac{t}{2} + \frac{1}{4a} \sin(2at) + C + C$
9. $\int \sin(at) \sin(bt) dt = \frac{\sin((a+b)t)}{2(a+b)} - \frac{\sin((a-b)t)}{2(a-b)} + C, a \neq b$
10. $\int \sin^2(at) dt = \frac{t}{2} - \frac{1}{4a} \sin(2at) + C$
11. $\int \sin(at) \cos(bt) dt = -\frac{\cos((a+b)t)}{2(a+b)} - \frac{\cos((a-b)t)}{2(a-b)} + C, a \neq b$
12. $\int \sin(at) \cos(at) dt = -\frac{\cos(2at)}{4a} + C$