ME 201 / MTH 281
Brief Table of Fourier Transforms

In this table, the Fourier transform and inverse transform are defined by the integrals $\tilde{f}(k) = \int_{-\infty}^{\infty} e^{-ikx} f(x)dx$ and $f(x) = \frac{1}{2\pi}\int_{-\infty}^{\infty} e^{ikx}\tilde{f}(k)dk$. In the table we use the notation $\delta(x-a)$ for the Dirac delta function, and $H(x\text{-}a)$ for the unit step function, defined to be 0 for $x < a$ and 1 for $x \geq a$.

f(x)	$\tilde{\mathbf{f}}(\mathbf{k})$
$\frac{1}{x^2+a^2}$, a > 0	$\frac{\pi}{a}e^{-a\lvert k\rvert}$
$e^{-a\lvert x\rvert}$, a > 0	$\frac{2a}{a^2+k^2}$
$xe^{-a\lvert x\rvert}$	$\frac{-4aik}{(a^2+k^2)^2}$
$x^2e^{-a\lvert x\rvert}$	$\frac{4a(a^2-3k^2)}{(a^2+k^2)^3}$
e^{-ax^2}, a > 0	$\sqrt{\frac{\pi}{a}}e^{-\frac{k^2}{4a}}$
xe^{-ax^2}, a > 0	$\frac{-ik\sqrt{\pi}}{2a^{3/2}}e^{-\frac{k^2}{4a}}$
$x^2e^{-ax^2}$, a > 0	$\frac{(2a-k^2)\sqrt{\pi}}{4a^{5/2}}e^{-\frac{k^2}{4a}}$
$H(x)e^{-ax}$, a > 0	$\frac{1}{a+ik}$
$a\frac{\sin(bx)}{x}$	$a\pi[H(k+b)-H(k-b)]$
$a[H(x+b)-H(x-b)]$ (top hat)	$\frac{2a\sin(bk)}{k}$
$\delta(x-a)$	e^{-ika}