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Fourier Sine Transforms: Expressions with Exponential Functions

No	*Original function*, $f(x)$	*Sine transform*, $\check{f}_s(u) = \int_0^\infty f(x)\sin(ux)\,dx$
1	$e^{-ax}, \quad a > 0$	$\dfrac{u}{a^2 + u^2}$
2	$x^n e^{-ax}, \quad a > 0,\ n = 1,\,2,\,\ldots$	$n!\left(\dfrac{a}{a^2+u^2}\right)^{n+1}\sum\limits_{k=0}^{[n/2]}(-1)^k C_{n+1}^{2k+1}\left(\dfrac{u}{a}\right)^{2k+1}$
3	$\dfrac{1}{x}e^{-ax}, \quad a > 0$	$\arctan\dfrac{u}{a}$
4	$\sqrt{x}\,e^{-ax}, \quad a > 0$	$\dfrac{\sqrt{\pi}}{2}(a^2+u^2)^{-3/4}\sin\left(\dfrac{3}{2}\arctan\dfrac{u}{a}\right)$
5	$\dfrac{1}{\sqrt{x}}e^{-ax}, \quad a > 0$	$\sqrt{\dfrac{\pi}{2}}\,\dfrac{(\sqrt{a^2+u^2}-a)^{1/2}}{\sqrt{a^2+u^2}}$
6	$\dfrac{1}{x\sqrt{x}}e^{-ax}, \quad a > 0$	$\sqrt{2\pi}\left(\sqrt{a^2+u^2}-a\right)^{1/2}$
7	$x^{n-1/2}e^{-ax}, \quad a > 0,\ n = 1,\,2,\,\ldots$	$(-1)^n\sqrt{\dfrac{\pi}{2}}\,\dfrac{\partial^n}{\partial a^n}\left[\dfrac{\left(\sqrt{a^2+u^2}-a\right)^{1/2}}{\sqrt{a^2+u^2}}\right]$
8	$x^{\nu-1}e^{-ax}, \quad a > 0,\ \nu > -1$	$\Gamma(\nu)(a^2+u^2)^{-\nu/2}\sin\left(\nu\arctan\dfrac{u}{a}\right)$
9	$\dfrac{1}{e^{ax}+1}, \quad a > 0$	$\dfrac{1}{2u} - \dfrac{\pi}{2a\sinh(\pi u/a)}$
10	$\dfrac{1}{e^{ax}-1}, \quad a > 0$	$\dfrac{\pi}{2a}\coth\left(\dfrac{\pi u}{a}\right) - \dfrac{1}{2u}$
11	$x\exp\left(-ax^2\right)$	$\dfrac{\sqrt{\pi}}{4a^{3/2}}\,u\exp\left(-\dfrac{u^2}{4a}\right)$
12	$\dfrac{1}{\sqrt{x}}\exp\left(-\dfrac{a}{x}\right)$	$\sqrt{\dfrac{\pi}{2u}}\,e^{-\sqrt{2au}}\left[\cos\left(\sqrt{2au}\right)+\sin\left(\sqrt{2au}\right)\right]$
13	$\dfrac{1}{x\sqrt{x}}\exp\left(-\dfrac{a}{x}\right)$	$\sqrt{\dfrac{\pi}{a}}\,e^{-\sqrt{2au}}\sin\left(\sqrt{2au}\right)$

References

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