Fourier Integral of f(x)=0, x<0 and f(x)=e^(-x),x>0

$A := int(\exp(-x)\cdot\cos(\text{alpha}\cdot x), x = 0 ..infinity);\ B := int(\exp(-x)\cdot\sin(\text{alpha}\cdot x), x = 0 ..infinity);$

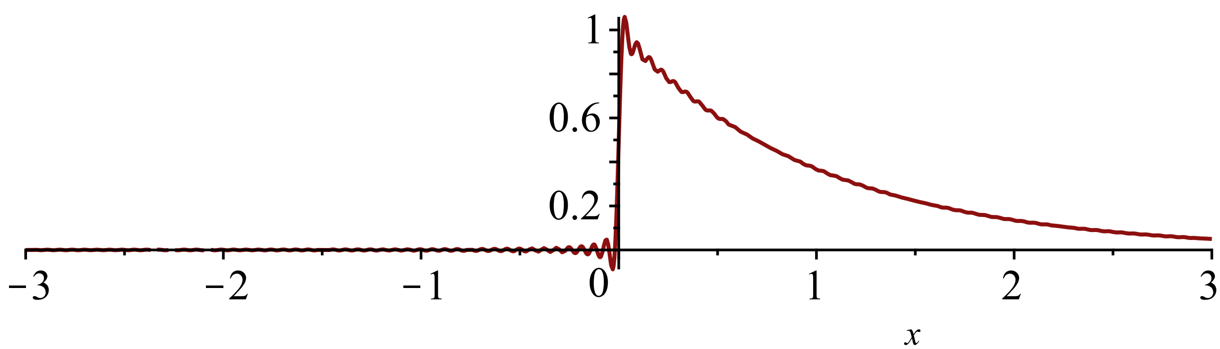
$$A := \frac{1}{\alpha^2 + 1}$$

$$B := \frac{\alpha}{\alpha^2 + 1} \quad (1)$$

$fapprox(x) := \frac{1}{\text{Pi}}\cdot int\left(\frac{(\cos(\text{alpha}\cdot x) + \text{alpha}\cdot\sin(\text{alpha}\cdot x))}{\alpha^2 + 1}, \text{alpha} = 0 ..100.\right);$

$$fapprox := x \rightarrow \frac{\int_0^{100.} \frac{\cos(\alpha x) + \alpha \sin(\alpha x)}{\alpha^2 + 1} \, d\alpha}{\pi} \quad (2)$$

$plot(fapprox(x), x = -3 ..3)$



$fexact(x) := \frac{1}{\text{Pi}}\cdot int\left(\frac{(\cos(\text{alpha}\cdot x) + \text{alpha}\cdot\sin(\text{alpha}\cdot x))}{\alpha^2 + 1}, \text{alpha} = 0 ..\text{infinity}\right);$

$$fexact := x \rightarrow \frac{\int_0^{\infty} \frac{\cos(\alpha x) + \alpha \sin(\alpha x)}{\alpha^2 + 1} \, d\alpha}{\pi} \quad (3)$$

$plot(fexact(x), x = -3 ..3)$