$$\hat{s}(\nu) = \int_{\mathbb{R}} s(t)\, e^{-i 2\pi \nu t}\, dt$$

$$\check{s}(\nu) = \int_{\mathbb{R}} s(t)\, e^{i 2\pi \nu t}\, dt$$

$$\|s\|^2 = \|\hat{s}\|^2$$

$$\|s\|^2 = \int_{\mathbb{R}} s(t)\, \overline{s(t)}\, dt = 1$$

$$\|\hat{s}\|^2 = \int_{\mathbb{R}} \hat{s}(\nu)\, \overline{\hat{s}(\nu)}\, d\nu = 1$$

$$(f * g)(x) = \int_{\mathbb{R}} f(y)\, g(x-y)\, dy$$

$$(f * g)(0) = \int_{\mathbb{R}} f(y)\, g(-y)\, dy$$

$$g_-(x) = g(-x)$$

$$(f * g_-)(0) = \int_{\mathbb{R}} f(x)\, g(x)\, dx$$

$$1 = (s * \bar{s}_-)(0)$$

$$\overline{\hat{s}} = \int_{\mathbb{R}} \bar{s}(t)\, e^{i 2\pi \nu t}\, dt = \int_{\mathbb{R}} \bar{s}(-t)\, e^{-i 2\pi \nu t}\, dt = \widehat{\bar{s}_-}$$

$$\check{\hat{s}} = \bar{s}_-$$

$$1 = \widehat{s\,\bar{s}}\,(0) = s * \check{\hat{s}}\,(0) = s * \bar{s}_-\,(0) = 1$$