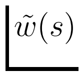
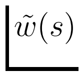
$\bar{s} = 0.25$

$h = 4$

$w(t)$


$\tilde{w}(s)$

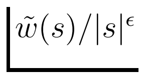

$\tilde{w}(s)$

$\int e^{-i2\pi st} w(t) dt$ and

$w(t)$

$$\int e^{i2\pi st}\tilde{w}(s)ds.$$

$$C_w = \int \frac{1}{|s|} \tilde{w}(s) ds.$$


$\tilde{w}(s)/|s|^{\epsilon}$

$\to 0$

$\underline{\lfloor s \to 0}$

$\epsilon > 0$

$$w(t) = \cos(2\pi t)(e^{-\pi t^2/c^2})$$

$\lfloor c$

$$\int w(ut)du = C_w \cdot \delta(t).$$

$t = 0$

Proof : $\int w(ut)du = \int \left\{ \int \frac{1}{|u|} \tilde{w}(\frac{s}{u}) e^{i2\pi st} ds \right\} du \ldots$

(s, u)

$(s' = s, u' = s/u)$

$\partial(s,u)/\partial(s',u') = |s'/u'^2|$

$$\int w(ut)du$$

$$\int \int \left| \frac{u'}{s'} \right| \tilde{w}(u') e^{i2\pi s' t} \left| \frac{s'}{u'^2} \right| ds' du'$$

$$\int \int \frac{1}{|u'|} \tilde{w}(u') e^{i2\pi s' t} ds' du'$$

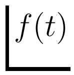
$$\left\{\int \frac{1}{|u'|}\tilde{w}(u')du'\right\} \cdot \left\{\int e^{i2\pi s't} ds'\right\}$$

$C_w \cdot \delta(t).$

$$w(t) = w(-t).$$

$F(u, a)$

$\lfloor L^2$


f(t)

$$F(u, a) = \int w[u(a - t)] f(t) dt.$$

$\underline{|a}$

$\lfloor u$

$\lfloor 2^u$

u^{-1}

$$f(t) = C_w^{-1} \int F(u, a = t) du.$$

Proof : $C_w^{-1} \int F(u, a = t) du$

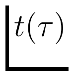
$$C_w^{-1}\int\left\{\int w[u(t-t')]f(t')dt'\right\}du$$

$$C_w^{-1} \int \left\{ \int w[u(t-t')]du \right\} f(t')dt'$$

$$C_w^{-1} \int C_w \delta(t - t') f(t') dt'$$

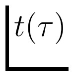
$f(t).$

$$g(\tau) = f[t(\tau)].$$


$t(\tau)$

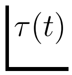
$\lfloor t$

$\lfloor_{\tau}$


t(τ)

$\approx$

$$t(\tau_0) + (\tau - \tau_0) \cdot \frac{dt}{d\tau}(\tau_0) \quad \text{and}$$


$\tau(t)$

$$\tau_0 + [t - t(\tau_0)] \cdot \left[\frac{dt}{d\tau}(\tau_0)\right]^{-1}.$$

$g(\tau)$

$$G(v, b) = \int w[v(b - \tau)]g(\tau)d\tau \quad \text{and}$$

$$g(\tau) = C_w^{-1} \int G(v, b = \tau) dv.$$

$G(v, b)$

$$G(v,b) \approx \left|\frac{dt}{d\tau}(b)\right|^{-1} \; F\left\{u = v \cdot \left[\frac{dt}{d\tau}(b)\right]^{-1},\; a = t(b)\right\}.$$

Proof : $G(v, b)$

$$\int w[v(b-\tau)] \cdot f[t(\tau)]d\tau$$

$$\int w[v(b-\tau)] \cdot f\left[t(b) + (\tau - b) \cdot \frac{dt}{d\tau}(b)\right] d\tau \ldots$$

t'

$$t(b) + (\tau - b) \cdot \frac{dt}{d\tau}(b) \quad \text{and}$$

τ

$$b + [t' - t(b)] \cdot \left[\frac{dt}{d\tau}(b)\right]^{-1}.$$

$G(v,b)$

$$\int w \left\{ v \cdot [t(b) - t'] \cdot \left[\frac{dt}{d\tau}(b) \right]^{-1} \right\} \cdot f(t') \cdot \left| \frac{dt}{d\tau}(b) \right|^{-1} \; dt'$$

$$\left|\frac{dt}{d\tau}(b)\right|^{-1}\int w\left\{v\left[\frac{dt}{d\tau}(b)\right]^{-1}\cdot[t(b)-t']\right\}\cdot f(t')dt'$$

$$\left|\frac{dt}{d\tau}(b)\right|^{-1} \; F\left\{u = v \cdot \left[\frac{dt}{d\tau}(b)\right]^{-1}, \; a = t(b)\right\}.$$

$m(t)$

$m_g(t) m_c(t),$

where $m_g(t)$

$e^{-\pi(\bar{s}t/h)^2}$

and $m_c(t)$

$\cos(2\pi\bar{s}t),$

so $m(t)$

$$e^{-\pi(\bar{s}t/h)^2} \cos(2\pi\bar{s}t).$$

$\bar{s}$

$\lfloor h$

$1/\bar{s}$

$m_g(0)$

1;

$m_g[h/(2\bar{s})]$

$m_g[-h/(2\bar{s})]$

$\exp(-\pi/4) \approx 0.456.$

$$\int m_g(t)dt = \int e^{-\pi(\bar{s}t/h)^2}dt = \frac{h}{\bar{s}},$$

$\lfloor 1$

0.5

$\bar{s} = 0.25$

$1/\bar{s} = 4$

$t = \pm 8$

$h/\bar{s} = 4/0.25 = 16$

$\tilde{m}_g(s)$

$$\int e^{-i2\pi st} m_g(t) dt = \int e^{-i2\pi st} e^{-\pi(\bar{s}t/h)^2} dt$$

$$\frac{h}{\bar{s}} e^{-\pi(hs/\bar{s})^2}.$$

$\bar{s}/h$

$h/\bar{s}$

$\tilde{m}_c(s)$

$$\int e^{-i2\pi st} m_c(t)dt = \int e^{-i2\pi st} \cos(2\pi\bar{s}t)dt$$

$$\frac{1}{2}\delta(s+\bar{s})+\frac{1}{2}\delta(s-\bar{s}).$$

$\tilde{m}(s)$

$$\int e^{-i2\pi st}m(t)dt = \int e^{-i2\pi st}m_g(t)m_c(t)dt$$

$$\tilde{m}_g(s) * \tilde{m}_c(s) = \int \tilde{m}_g(s')\tilde{m}_c(s-s')ds'$$

$$\frac{h}{2\bar{s}}e^{-\pi[h(s+\bar{s})/\bar{s}]^2} + \frac{h}{2\bar{s}}e^{-\pi[h(s-\bar{s})/\bar{s}]^2}.$$

$$\int |m_g(t)|^2 dt = \int e^{-2\pi(\bar{s}t/h)^2} dt = \frac{1}{\sqrt{2}} \frac{h}{\bar{s}} \ ,$$

$$\int |m_g(t)|^2 t^2 dt = \int e^{-2\pi(\bar{s}t/h)^2} t^2 dt = \frac{1}{4\sqrt{2}\pi} \frac{h^3}{\bar{s}^3} \ .$$

$\Delta^2 t$

$$\frac{\int |m_g(t)|^2 t^2 dt}{\int |m_g(t)|^2 dt} = \frac{1}{4\pi} \frac{h^2}{\bar{s}^2};$$

Δt

$$\frac{1}{2\sqrt{\pi}}\frac{h}{\bar{s}} \ .$$

$\Delta^2 s$

$$\frac{\int |\tilde{m}_g(s)|^2 s^2 ds}{\int |\tilde{m}_g(s)|^2 ds} = \frac{1}{4\pi}\frac{\bar{s}^2}{h^2};$$

Δs

$$\frac{1}{2\sqrt{\pi}}\frac{\bar{s}}{h} .$$

$$\Delta s \Delta t = \frac{1}{4\pi}.$$