Ejercicios propuestos:

1) $5 \longleftrightarrow ?$

    Si $\delta(t) \longleftrightarrow 1$

    $1 \longleftrightarrow 2\pi\,\delta(-\omega)$

    $5 \cdot 1 \longleftrightarrow 5 \cdot 2\pi\,\delta(\omega)$

    $5 \longleftrightarrow 10\pi\,\delta(\omega)$

2) $? \longleftrightarrow \dfrac{1}{\omega}$

    Si $sgn(t) \longleftrightarrow \dfrac{2}{i\omega}$

    $\dfrac{1}{2} \cdot sgn(t) \longleftrightarrow \dfrac{1}{2} \cdot \dfrac{2}{i\omega}$

    $\dfrac{1}{2}\,sgn(t) \longleftrightarrow \dfrac{1}{i\omega}$

    $\dfrac{1}{2}\,sgn(t) \longleftrightarrow -j \cdot \dfrac{1}{\omega} \quad ; \quad -\dfrac{1}{2}\,sgn(t) \longleftrightarrow \dfrac{1}{\omega}$

3) $\cos 10t \longleftrightarrow ?$ Si $\delta(t) \longleftrightarrow 1$

    $1 \longleftrightarrow 2\pi\,\delta(-\omega)$

    $\cos 10t \cdot 1 \longleftrightarrow \dfrac{1}{2}\Big[2\pi\big(\delta(\omega+10)+\delta(\omega-10)\big)\Big]$

    $\cos 10t \longleftrightarrow \pi\delta(\omega+10) + \pi\delta(\omega-10)$

4) $? \longleftrightarrow u(\omega)\,e^{-i6\omega}$

    Si $u(t) \longleftrightarrow \pi\delta(\omega) + \dfrac{1}{i\omega}$

    $\pi\delta(t) + \dfrac{1}{it} \longleftrightarrow 2\pi\,u(-\omega)$

    $\pi\delta(-t) + \dfrac{1}{-t} \longleftrightarrow 2\pi\,u(\omega)$

    $\dfrac{1}{2}\delta(-t) + \dfrac{1}{2\pi - it} \longleftrightarrow u(\omega)$

    $\dfrac{1}{2}\delta(-(t-6)) + \dfrac{1}{2\pi \cdot -i(t-6)} \longleftrightarrow u(\omega)\,e^{-i6\omega}$

    $\dfrac{1}{2}\delta(t-6) + \dfrac{1}{-i2\pi(t-6)} \longleftrightarrow u(\omega)\,e^{-i6\omega}$

5) $e^{-2(t-1)} \cdot u(t-1) \longleftrightarrow\ ?$

$$\text{Si } e^{-at} u(t) \longleftrightarrow \frac{1}{a+j\omega}$$

$$\text{con } a = 2$$

$$e^{-2t} u(t) \longleftrightarrow \frac{1}{2+j\omega} \ ; \ e^{-2(t-1)} \cdot u(t-1) \longleftrightarrow \frac{1}{2+j\omega} \cdot e^{-j\omega}$$

6) $Sa\ 5t \longleftrightarrow\ ?$

$$\text{Si } A\sqcap_d(t) \longleftrightarrow A\, d\, Sa \frac{\omega d}{2}$$

$$A\, d\, Sa \frac{t d}{2} \longleftrightarrow 2\pi\, A\sqcap_d(\omega); \quad \text{con } d = 10 \quad y \quad A = \frac{1}{10}$$

$$\frac{1}{10} \cdot 10 \cdot Sa\, t\frac{10}{2} \longleftrightarrow 2\pi \frac{1}{10} \sqcap_{10}(-\omega)$$

$$Sa\, 5t \longleftrightarrow \frac{\pi}{5} \sqcap_{10}(-\omega)$$

7) $?\ \longleftrightarrow \delta(2\omega - 1)$

$$\text{Si } \delta(t) \longleftrightarrow 1$$

$$\delta(t-1) \longleftrightarrow e^{-j\omega}$$

$$\delta(2t-1) \longleftrightarrow \frac{1}{|2|} e^{-j\frac{\omega}{2}}$$

$$\frac{1}{|2|} e^{-j\frac{t}{2}} \longleftrightarrow 2\pi \delta(-(2\omega-1))$$

$$\frac{1}{4\pi} e^{-j\frac{t}{2}} \longleftrightarrow \delta(2\omega-1)$$

8) $C_2(t-1)\cdot e^{-jt} \longleftrightarrow ?$

$\quad$ Si $A C d t \longleftrightarrow A d\, Sa\,\dfrac{w d}{2}$; $A=1$ y $d=2$

$\quad\quad C_2(t) \longleftrightarrow 2\, Sa\, w$

$\quad C_2(t-1) \longleftrightarrow 2\, Sa\, w \cdot e^{-jw}$

$C_2(t-1)\, e^{-jt} \longleftrightarrow 2\, Sa\,(w+1)\cdot e^{-j(w+1)}$

9) $t^2\, sgn\,(2t+1) \longleftrightarrow ?$

$\quad\quad$ Si $\quad sgn(t) \longleftrightarrow \dfrac{2}{iw}$

$\quad sgn(t+1) \longleftrightarrow \dfrac{2}{iw}\cdot e^{jw}$

$\quad sgn(2t+1) \longleftrightarrow \dfrac{1}{|2|}\cdot \dfrac{2}{i\frac{w}{2}}\cdot e^{j\frac{w}{2}}$

$\quad (-it)^2\, sgn\,(2t+1) \longleftrightarrow \dfrac{d^2}{dw}\left[\dfrac{2}{iw}\cdot e^{j\frac{w}{2}}\right]$

$\quad -t^2\, sgn\,(2t+1) \longleftrightarrow \dfrac{d^2}{d^2 w}\left[\dfrac{2}{iw}\cdot e^{j\frac{w}{2}}\right]$

$\quad t^2\, sgn\,(2t+1) \longleftrightarrow -\dfrac{d^2}{d^2 w}\left[\dfrac{2}{iw}\cdot e^{j\frac{w}{2}}\right]$

10) $\dfrac{t^2}{10-it} \longleftrightarrow ?$; Si $e^{-at}\,u(t) \longleftrightarrow \dfrac{1}{a+iw}$; $a=10$

$\quad \dfrac{1}{10+it} \longleftrightarrow 2\pi\, e^{10w}\, u(-w)$

$\quad \dfrac{1}{10+i(-1\cdot t)} \longleftrightarrow \dfrac{1}{|-1|}\, 2\pi\, e^{-10\frac{w}{1}}\, u(w)$

$\quad \dfrac{1}{10-it} \longleftrightarrow \dfrac{1}{|-1|}\, 2\pi\, e^{-10w}\, u(w);$

$\quad (-jt)^2\dfrac{1}{10-it} \longleftrightarrow \dfrac{d^2}{d^2 w}\big[\,...\,F(w)\big]$

$\quad \dfrac{t^2}{10-it} \longleftrightarrow -\dfrac{d^2}{d^2 w}\left[\dfrac{2\pi}{|-1|}\, e^{-10w}\, u(w)\right]$

11.) $\frac{10}{t-1} \longleftrightarrow ?$

Si $\quad \text{sgn}(t) \longleftrightarrow \frac{2}{j\omega}$

$\frac{2}{jt} \longleftrightarrow 2\pi\,\text{sgn}(-\omega)$ $\qquad$ $\frac{10}{t} \longleftrightarrow \frac{1}{j}\cdot 10\,\pi\,\text{sgn}(-\omega)$

$5\cdot\frac{2}{jt} \longleftrightarrow 10\pi\,\text{sgn}(-\omega)$

$\frac{10}{jt} \longleftrightarrow 10\pi\,\text{sgn}(-\omega)$ $\qquad$ $\frac{10}{(t-1)} \longleftrightarrow -\frac{10}{j}\,\pi\,\text{sgn}(-\omega)\,e^{-j\omega}$

$-j\frac{10}{t} \longleftrightarrow 10\pi\,\text{sgn}(-\omega)$

12.) $\underbrace{-2e^{j5t}}_{\text{①}} \underbrace{-5}_{\text{②}} \underbrace{+8}_{\text{③}} \underbrace{+2\cdot e^{j5t}}_{\text{④}} \longleftrightarrow ?$

① Si $\delta(t) \longleftrightarrow 1$

$1 \longleftrightarrow 2\pi\,\delta(-\omega)$

$1 \longleftrightarrow 2\pi\,\delta(\omega)$

$-2\cdot 1 \longleftrightarrow -4\pi\,\delta(\omega)$

$-2\cdot e^{j5t} \longleftrightarrow -4\pi(\omega-5)$

② Si $\delta(t) \longleftrightarrow 1$

$-5\cdot 1 \longleftrightarrow 10\pi\,\delta(-\omega)$

$-5 \longleftrightarrow -10\pi\,\delta(\omega)$

③ Si $\delta(t) \longleftrightarrow 1$

$8 \longleftrightarrow 16\pi\,\delta(\omega)$

④ Si $\delta(t) \longleftrightarrow$

$2 \longleftrightarrow 4\pi\,\delta(\omega)$

$2\,e^{j5t} \longleftrightarrow 4\pi\delta(\omega-5)$

$-2e^{j5t}-5+8+2e^{j5t} \longleftrightarrow -4\pi(\omega-5)\ldots$

$\ldots -10\pi\,\delta(\omega)+16\pi\,\delta(\omega)+4\pi\delta(\omega-5)$

13) $e^{-\frac{t^2}{2}}$? ; Si $e^{-\frac{t^2}{2a^2}} \longrightarrow a\sqrt{2\pi}\, e^{-\frac{a^2 w^2}{2}}$; $a=1$

$e^{-\frac{t^2}{2}} \longrightarrow \sqrt{2\pi}\, e^{-\frac{w^2}{2}}$

14) $\frac{2}{1+e}\cos 5t \longrightarrow$? ; Si $e^{-a|t|} \longrightarrow \frac{2a}{a^2+w^2}$; $a=1$

$\frac{2}{1+e^2} \longrightarrow 2\pi e^{-|w|}$

$\frac{2}{1+e^2}\cos 5t \longrightarrow \pi\left[e^{-|w+5|} + e^{-|w-5|}\right]$

$\frac{2}{1+e^2}\cos 5t \longrightarrow \frac{1}{2}\left[2\pi\left(e^{-|w+5|} + e^{-|w-5|}\right)\right]$

15) $e^{-\frac{1}{2}(t^2-6t)} \longrightarrow$? ; Se $e^{-\frac{t^2}{2a}} \longrightarrow a\sqrt{2\pi}\, e^{-\frac{a^2 w^2}{2}}$

$a=1$; $e^{-\frac{t^2}{2}} \longrightarrow \sqrt{2\pi}\, e^{-\frac{w^2}{2}}$

$e^{-(t-3)^2} \longrightarrow \sqrt{2\pi}\, e^{-\frac{w^2}{2}} \cdot e^{-3jw}$

$e^{-\frac{1}{2}(t^2-6t-9)} \longrightarrow \sqrt{2\pi}\cdot e^{-\frac{w^2}{2}}\cdot e^{-j3w}$

$e^{-\frac{1}{2}(t^2-6t-9)} \longrightarrow e^{-\frac{w^2}{2}}$

16) ? $\longrightarrow e$; Si $e^{-\frac{t^2}{2a^2}} \longrightarrow a\sqrt{2\pi}\, e^{-\frac{a^2 w^2}{2}}$; $a=1$

$e^{-\frac{t^2}{2}} \longrightarrow \sqrt{2\pi}\, e^{-\frac{w^2}{2}}$

$e^{-(\frac{t}{\sqrt{3}}-t)^2} \longrightarrow \frac{1}{\sqrt{3}}\, e^{-(\frac{w}{\sqrt{3}})^2}$

$e^{-\frac{t^2}{2}-6t} \longrightarrow \frac{1}{\sqrt{3}}\, e^{-\frac{w^2}{6}}$

$e^{-3\frac{t^2}{2}} \longrightarrow \frac{1}{|\sqrt{3}|}\, e^{-\frac{w^2}{6}}$; $2\pi|\sqrt{3}|$

$\frac{1}{|\sqrt{3}|}\, e^{+\frac{6}{t^2}} \longrightarrow e^{-\frac{3}{2}w^2}$

17) $\dfrac{t^2 + 10t + 25}{t^2 - 25} \longleftrightarrow ?$

$\Rightarrow \dfrac{(t+5)^2}{(t-5)(t+5)} = \dfrac{t+5}{t-5} \longleftrightarrow ? \; ; \; \dfrac{t}{t-5} + \dfrac{5}{t-5} \longleftrightarrow ?$

$\dfrac{t}{t-5} \longleftrightarrow ? \; ; \; sgn(t) \longleftrightarrow \dfrac{2}{i\omega} \; ; \; \dfrac{2}{jt} \longleftrightarrow 2\pi \, sgn(-\omega)$

$\dfrac{1}{t} \longleftrightarrow \dfrac{j}{2} \cdot (-2\pi \, sgn(\omega)) \; ; \; \dfrac{1}{t-5} \longleftrightarrow -j\pi \, sgn(\omega) e^{-j5\omega}$

$\cdot j \, \dfrac{t}{t-5} \longleftrightarrow -j\pi \, \dfrac{d}{d\omega}\left[sgn(\omega) e^{-j5\omega} \right] \qquad \dfrac{5}{t-5} \longleftrightarrow ?$

$\dfrac{t}{t-5} \longleftrightarrow \pi \, \dfrac{d}{d\omega}\left[sgn(\omega) e^{-j5\omega} \right] \quad 5 \cdot \dfrac{1}{t-5} \longleftrightarrow -5j\pi \, sgn(\omega) e^{-j5\omega}$

$\dfrac{t}{t-5} + \dfrac{5}{t-5} \longleftrightarrow \pi \, \dfrac{d}{d\omega}\left[sgn(\omega) e^{-j5\omega} \right] - j5\pi \, sgn(\omega) e^{-j5\omega}$

18) $5(t-5) e^{-16[t^2 - 10t + 25]} \longleftrightarrow ?$

$14) \; ? \; \longleftrightarrow \; \dfrac{6e^{+iw}\,sen(2w)}{4+w^2}$

$Si \quad e^{-a|t|} \longleftrightarrow \dfrac{2a}{a^2+w^2} \quad ; \; a=3$

$e^{-3|t|} \longrightarrow \dfrac{6}{4+w^2} \; ; \; e^{-3|t+1|} \longleftrightarrow \dfrac{6\cdot e^{itw}}{4+w^2}$

$\dfrac{i}{2}\left[e^{-3|t+6|} \; te^{-3|t+2|} \right] \longleftrightarrow \dfrac{6\cdot e^{itw}\cdot sen\,2w}{4+w^2}$

$20) \; F^{-1}\left\{ 2\delta(w+8) + 2\delta(w-8) \right\}$

$Si \quad \delta(t) \longleftrightarrow 1 \; ; \quad 1 \longleftrightarrow 2\pi\,\delta(-w)^{\swarrow +}$

$cos\,8t \longleftrightarrow \dfrac{1}{2}\pi\left[\delta(w+8) + \delta(w-8) \right]$

$\dfrac{2\,cos\,8t}{\pi} \longleftrightarrow 2\delta(w+8) + 2\delta(w-8)$