From ω to f

$\cdot\, h(t) = \int_{-\infty}^{\infty} H(f) e^{-j2\pi f t}\, df \qquad \cdot\, H(f) = \int_{-\infty}^{\infty} h(t) e^{j2\pi f t}\, dt$

⇒ It's always the case that if a Property / Famous Pair are known for ω then using $\omega = 2\pi f$ (and sometimes other Properties like $\delta(at) = \frac{1}{a}\delta(t)$) is sufficient to write the Property / Famous Pair in f.

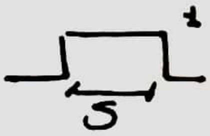
Regardless,

- $g(t) \longleftrightarrow G(f)$ then $G(t) \longleftrightarrow g(-f)$ # Duality
- $g(t-t_0) \longleftrightarrow G(f) \cdot e^{-j2\pi f t_0}$ # Time Shift
- $g(t) \cdot e^{j2\pi f_c t} \longleftrightarrow G(f-f_c)$ # Frequency Shift
- $g_1(t) g_2(t) \longleftrightarrow G_1(f) * G_2(f)$ # Multiplication
- $g_1(t) * g_2(t) \longleftrightarrow G_1(f) G_2(f)$ # Convolution
- $\int_{-\infty}^{\infty} |g(t)|^2 dt = \int_{-\infty}^{\infty} |G(f)|^2 df$ # Energy Theorem

* Some Famous Pairs

⇒ $\mathrm{Sinc}(x) = \frac{\sin \pi x}{\pi x}$ has nulls for $x \in \mathbb{Z}^*$

1. $\delta(t) \longleftrightarrow 1$ and $1 \longleftrightarrow \delta(f)$
2. $\mathrm{rect}(\frac{t}{S}) \longleftrightarrow S \cdot \mathrm{Sinc}(fS)$
3. $\mathrm{tri}(\frac{t}{S}) \longleftrightarrow S \cdot \mathrm{Sinc}^2(fS)$
4. $\cos(2\pi f_c) \longleftrightarrow \frac{1}{2}(\delta(f-f_c) + \delta(f+f_c))$
5. $\sum_{n=-\infty}^{\infty} \delta(t - nT_s) \longleftrightarrow f_s \sum_{k=-\infty}^{\infty} \delta(f - kf_s)$



* Also divide by j for Sine