

## ECE 313 Exam 1 Tables (DRAFT)

$$\begin{aligned}\cos(\theta) &= \frac{1}{2} (e^{j\theta} + e^{-j\theta}) \\ \sin(\theta) &= \frac{1}{2j} (e^{j\theta} - e^{-j\theta})\end{aligned}$$

$$\begin{aligned}\sin(a \pm b) &= \sin(a) \cos(b) \pm \cos(a) \sin(b) \\ \cos(a \pm b) &= \cos(a) \cos(b) \mp \sin(a) \sin(b)\end{aligned}$$

$$\begin{aligned}\cos(a) \cos(b) &= \frac{1}{2} [\cos(a - b) + \cos(a + b)] \\ \sin(a) \sin(b) &= \frac{1}{2} [\cos(a - b) - \cos(a + b)] \\ \sin(a) \cos(b) &= \frac{1}{2} [\sin(a - b) + \sin(a + b)]\end{aligned}$$

Time Function	Fourier Transform
$\delta(t)$	1
$p(t) = \begin{cases} 1, &  t  \leq 1/2 \\ 0, &  t  > 1/2 \end{cases}$	$\frac{\sin(\pi f)}{\pi f} = \text{sinc}(f)$
$\Lambda(t) = \begin{cases} 1 -  t , &  t  \leq 1 \\ 0, &  t  > 1 \end{cases}$	$\text{sinc}^2(f)$
$\cos(2\pi f_c t)$	$\frac{1}{2}\delta(f - f_c) + \frac{1}{2}\delta(f + f_c)$
$\sin(2\pi f_c t)$	$\frac{1}{2j}\delta(f - f_c) - \frac{1}{2j}\delta(f + f_c)$
$e^{-at}u(t)$	$\frac{1}{a + j2\pi f}$
$x(at + b)$	$\frac{1}{ a }X\left(\frac{f}{a}\right)e^{j2\pi\frac{b}{a}f}$
$x(t) * y(t)$	$X(f)Y(f)$
$x(t)y(t)$	$X(f) * Y(f)$
$\frac{d}{dt}x(t)$	$(j2\pi f)X(f)$

Parseval's Relation: If  $X(f)$  is the Fourier Transform of  $x(t)$ ,

$$\int_{-\infty}^{\infty} |x(t)|^2 dt = \int_{-\infty}^{\infty} |X(f)|^2 df$$