Table of Trigonometric Identities and Basic Functions

Trigonometric Identities		Definitions of Basic Functions

$\exp(\pm j\theta) = \cos(\theta) \pm j\sin(\theta)$	$\sin(\alpha \pm \beta) = \sin(\alpha)\cos(\beta) \pm \cos(\alpha)\sin(\beta)$	**Rectangle:** $\mathrm{rect}\left(\dfrac{t}{T}\right) = \begin{cases} 1; & -T/2 \le t < T/2 \\ 0; & \text{elsewhere} \end{cases}$
$\cos(\theta) = 0.5\left[\exp(j\theta) + \exp(-j\theta)\right]$	$\cos(\alpha \pm \beta) = \cos(\alpha)\cos(\beta) \mp \sin(\alpha)\sin(\beta)$	
$\sin(\theta) = -0.5j\left[\exp(j\theta) - \exp(-j\theta)\right]$	$\tan(\alpha \pm \beta) = \dfrac{\tan(\alpha) \pm \tan(\beta)}{1 \mp \tan(\alpha)\tan(\beta)}$	**Triangle:** $\mathrm{tri}\left(\dfrac{t}{T}\right) = \begin{cases} 1 - |t|/T; & |t| \le T \\ 0; & |t| > T \end{cases}$
$\sin^2(\theta) + \cos^2(\theta) = 1$		
$\sin(2\theta) = 2\sin(\theta)\cos(\theta)$	$\sin(\alpha)\sin(\beta) = 0.5\left[\cos(\alpha - \beta) - \cos(\alpha + \beta)\right]$	**Sine Cardinal:** $\mathrm{sinc}\left(\dfrac{t}{T}\right) = \begin{cases} \dfrac{\sin(\pi t/T)}{\pi t/T}; & t \ne 0 \\ 1; & t = 0 \end{cases}$
$\cos(2\theta) = \cos^2(\theta) - \sin^2(\theta)$	$\cos(\alpha)\cos(\beta) = 0.5\left[\cos(\alpha - \beta) + \cos(\alpha + \beta)\right]$	
$\sin^2(\theta) = 0.5\left[1 - \cos(2\theta)\right]$	$\sin(\alpha)\cos(\beta) = 0.5\left[\sin(\alpha - \beta) + \sin(\alpha + \beta)\right]$	**Signum:** $\mathrm{sgn}(t) = \begin{cases} 1; & t \ge 0 \\ -1; & t < 0 \end{cases}$
$\cos^2(\theta) = 0.5\left[1 + \cos(2\theta)\right]$	$C\cos(\theta) - S\sin(\theta) = \sqrt{C^2 + S^2}\,\cos\left[\theta + \tan^{-1}\left(\dfrac{S}{C}\right)\right]$	**Unit Impulse:** $\delta(t) = \begin{cases} \infty; & t = 0 \\ 0; & t \ne 0 \end{cases} \qquad \int_{0^-}^{0^+} \delta(t)\,dt = 1$

Complex Unit: $\left(j = \sqrt{-1} = e^{j\pi/2} = e^{j90°}\right) \quad \left(-j = \dfrac{1}{j} = e^{-j\pi/2} = e^{-j90°}\right) \quad \left(j^2 = -1\right)$

Euler's Formula: $e^{j\theta} = \cos(\theta) + j\sin(\theta)$

Unit Step: $u(t) = \begin{cases} 1; & t \ge 0 \\ 0; & t < 0 \end{cases}$