

FOURIER TRANSFORM SUMMARY SHEET

Time Domain	Transform	Frequency Domain
Continuous Periodic with period $T_0$ Fundamental frequency $\omega_0 = \frac{2\pi}{T_0}$	<u>Fourier Series</u>  $x(t) = \sum_{k=-\infty}^{\infty} a_k e^{jk\omega_0 t}$ $a_k = \frac{1}{T_0} \int_{T_0} x(t) e^{-jk\omega_0 t} dt$	Discrete Aperiodic
Continuous Aperiodic	<u>Fourier Transform</u>  $x(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} X(\omega) e^{j\omega t} d\omega$ $X(\omega) = \int_{-\infty}^{\infty} x(t) e^{-j\omega t} dt$	Continuous Aperiodic
Discrete Periodic with period $N$	<u>Discrete-Time Fourier Series</u>  $x[n] = \sum_{k=\langle N \rangle} a_k e^{jk(\frac{2\pi}{N})n}$ $a_k = \frac{1}{N} \sum_{n=\langle N \rangle} x[n] e^{-jk(\frac{2\pi}{N})n}$	Discrete Periodic with period $N$
Discrete Aperiodic	<u>Discrete-Time Fourier Transform</u>  $x[n] = \frac{1}{2\pi} \int_{2\pi} X(e^{j\omega}) e^{j\omega n} d\omega$ $X(e^{j\omega}) = \sum_{n=-\infty}^{\infty} x[n] e^{-j\omega n}$	Continuous Periodic with period $2\pi$