Common Z Transform Pairs

x[n]	X(z)	ROC
$\delta[n]$	1	All z
$u[n]$	$\frac{1}{1-z^{-1}}$	$\|z\| > 1$
$a^n u[n]$	$\frac{1}{1-a\,z^{-1}}$	$\|z\| > \|a\|$
$(n+1)\,a^n u[n]$	$\frac{1}{(1-a\,z^{-1})^2}$	$\|z\| < \|a\|$
$a^n \cos(\omega_o n)\, u[n]$	$\frac{1-(a\cos\omega_o)z^{-1}}{1-(2a\cos\omega_o)z^{-1}+a^2z^{-2}}$	$\|z\| > a$
$a^n \sin(\omega_o n)\, u[n]$	$\frac{(a\sin\omega_o)z^{-1}}{1-(2a\cos\omega_o)z^{-1}+a^2z^{-2}}$	$\|z\| > a$

Common example: any finite length x[n] can be broken into sums of scaled, time-shifted $\delta[n-n_o]$, so its Z transform will be sums of similarly scaled z^{-no} (see time-shift property below), with a ROC everywhere except possibly z=0 or z=∞ (evaluate z at these points to see)

Z Transform Properties

Property name	x[n], h[n]	X(z), H(z)	ROC: R_x, R_h
Linearity	a x[n] + b h[n]	a X(z) + b H(z)	Intersection of R_x, R_h
Time-shifting	x[n-3]	z^{-3} X(z)	R_x except possibly z=0 or ∞ (evaluate z at these points to see)
Differentiation of X(z)	n x[n]	$-z\frac{dX(z)}{dz}$	R_x except possibly z=0 or ∞
Convolution	x[n] * h[n]	X(z) H(z)	Intersection of R_x, R_h