Table of Common Z-Transforms

links	style

Prerequisite

- Introduction to the Z-Transform
- Region of Convergence

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Summary: Lists the z-transfrom and the ROC for several generalized, common signals.
Objectives:

The table below will focus on unilateral and bilateral **Z-TRANSFORMS**. When given a signal (or sequence), the table can be very useful in finding the corresponding z-transform. The table also specifies the REGION OF CONVERGENCE, which allows us to pick out the unilateral and bilateral transforms.

> **NOTE:** The notation for z found in the table below may differ from that found in other tables. For example, the basic z-transform of $u[n]$ can be written as either of the following two expressions, which are equal:

$$\frac{z}{z-1} = \frac{1}{1-z^{-1}} \quad (1)$$

Signal	Z-Transform	ROC
$\delta[n-k]$	z^{-k}	All z
$u[n]$	$\frac{z}{z-1}$	$\|z\| > 1$
$-(u[-n-1])$	$\frac{z}{z-1}$	$\|z\| < 1$
$nu[n]$	$\frac{z}{(z-1)^2}$	$\|z\| > 1$
$n^2u[n]$	$\frac{z(z+1)}{(z-1)^3}$	$\|z\| > 1$
$n^3u[n]$	$\frac{z\left(z^2+4z+1\right)}{(z-1)^4}$	$\|z\| > 1$
$(-(\alpha^n))u[-n-1]$	$\frac{z}{z-\alpha}$	$\|z\| < \|\alpha\|$
$\alpha^n u[n]$	$\frac{z}{z-\alpha}$	$\|z\| > \|\alpha\|$
$n\alpha^n u[n]$	$\frac{\alpha z}{(z-\alpha)^2}$	$\|z\| > \|\alpha\|$
$n^2\alpha^n u[n]$	$\frac{\alpha z(z+\alpha)}{(z-\alpha)^3}$	$\|z\| > \|\alpha\|$
$\frac{\prod_{k=1}^{m}(n-k+1)}{\alpha^m m!}\alpha^n u[n]$	$\frac{z}{(z-\alpha)^{m+1}}$	

$\gamma^n \cos(\alpha n) u[n]$	$\frac{z(z - \gamma \cos(\alpha))}{z^2 - (2\gamma \cos(\alpha))z + \gamma^2}$	$\|z\| > \|\alpha\|$
$\gamma^n \sin(\alpha n) u[n]$	$\frac{z\gamma \sin(\alpha)}{z^2 - (2\gamma \cos(\alpha))z + \gamma^2}$	$\|z\| > \|\alpha\|$

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