Table 2.1. *The z transforms of commonly used sequences.*

$x(n)$	$X(z)$	Convergence region
$\delta(n)$	1	$z \in \mathbb{C}$
$u(n)$	$\frac{z}{(z-1)}$	$\lvert z\rvert > 1$
$(-a)^n u(n)$	$\frac{z}{(z+a)}$	$\lvert z\rvert > a$
$nu(n)$	$\frac{z}{(z-1)^2}$	$\lvert z\rvert > 1$
$n^2 u(n)$	$\frac{z(z+1)}{(z-1)^3}$	$\lvert z\rvert > 1$
$e^{an} u(n)$	$\frac{z}{(z-e^a)}$	$\lvert z\rvert > e^a$
$\cos(\omega n)u(n)$	$\frac{z[z-\cos(\omega)]}{z^2-2z\cos(\omega)+1}$	$\lvert z\rvert > 1$
$\sin(\omega n)u(n)$	$\frac{z\sin(\omega)}{z^2-2z\cos(\omega)+1}$	$\lvert z\rvert > 1$
$\frac{1}{n}u(n-1)$	$\ln\left(\frac{z}{z-1}\right)$	$\lvert z\rvert > 1$
$\sin(\omega n+\theta)u(n)$	$\frac{z^2\sin(\theta)+z\sin(\omega-\theta)}{z^2-2z\cos(\omega)+1}$	$\lvert z\rvert > 1$
$e^{an}\cos(\omega n)u(n)$	$\frac{z^2-ze^a\cos(\omega)}{z^2-2ze^a\cos(\omega)+e^{2a}}$	$\lvert z\rvert > e^a$
$e^{an}\sin(\omega n)u(n)$	$\frac{ze^a\sin(\omega)}{z^2-2ze^a\cos(\omega)+e^{2a}}$	$\lvert z\rvert > e^a$

Therefore, for a linear system, given $X(z)$, the z-transform representation of the input, and the coefficients of its difference equation, we can use equation (2.120) to find $Y(z)$, the z transform of the output. Applying the inverse z-transform relation in equation (2.36), the output $y(n)$ can be computed for all n.[1]

[1] One should note that, since equation (2.120) uses z transforms, which consist of summations for $-\infty < n < \infty$, then the system has to be describable by a difference equation for $-\infty < n < \infty$. This is the case only for initially relaxed systems, that is, systems that produce no output if the input is zero for $-\infty < n < \infty$. In our case, this does not restrict the applicability of equation (2.120), because we are only interested in linear systems, which, as seen in Chapter 1, must be initially relaxed.