Z-Transform and Inverse Z-Transform

	Questions	Answers with ROC
	Find Z-Transform and its ROC of the following sequences	
1	$f(k) = 3^k, k \geq 0$	1/[1-(3/z)] ; $\|z\| > 3$
2	$f(k) = (1/6)^k, k \geq 0$	1/[1-(1/6z)] ; $\|z\| > \frac{1}{6}$
3	$f(k) = 2, k \geq 0$	2/[1-(1/z)] ; $\|z\| > 1$
4	$f(k) = (1/3)^k, k < 0$	3z/[1-(3z)] ; $\|z\| < \frac{1}{3}$
5	$f(k) = \begin{cases} 3^k, & k < 0 \\ 2^k, & k \geq 0 \end{cases}$	$\frac{2z}{[(3-z)(z-2)]}$; $2 < \|z\| < 3$
6	$f(k) = \begin{cases} 4^k, & k < 0 \\ 3^k, & k \geq 0 \end{cases}$	$\frac{3z}{[(4-z)(z-3)]}$; $3 < \|z\| < 4$
7	$f(k) = \begin{cases} a^k, & k < 0 \\ b^k, & k \geq 0 \end{cases}$, $a, b > 0, a > b$	$\frac{(a-b)z}{[(a-z)(z-b)]}$; $b < \|z\| < a$
8	$f(k) = k3^k, k \geq 0$	$3z/(z-3)^2$; $\|z\| > 3$
9	$f(k) = ka^k, k \geq 0, a > 0$	$az/(z-a)^2$; $\|z\| > a$
10	$f(k) = 3^k/k$, $k > 1$	$-\log\left(1-\frac{3}{z}\right)$; $\|z\| > 3$
11	$f(k) = a^k/k$, $k > 1, a > 0$	$-\log\left(1-\frac{a}{z}\right)$; $\|z\| > a$
12	$f(k) = (1/2)^{\|k\|}$, *for all* k	$\frac{1}{2}.\frac{z}{1-(z/2)} + \frac{1}{1-2z}$; $\frac{1}{2} < \|z\| < 2$
13	$f(k) = (1/4)^{\|k\|}$, *for all* k	$\frac{1}{4}.\frac{z}{1-(z/4)} + \frac{1}{1-1/4z}$; $\frac{1}{4} < \|z\| < 4$
14	$f(k) = a^k$, *for all* k , $0 < a < 1$	$\frac{az}{1-az} + \frac{1}{1-(a/z)}$; $\|a\| < \|z\| < \frac{1}{\|a\|}$
15	$f(k) = \left(\frac{3^k}{k!}\right)$, $k \geq 0$	$e^{3/z}$, ROC $z-$ plane
16	$f(k) = \left(\frac{5^k}{k!}\right)$, $k \geq 0$	$e^{5/z}$, ROC $z-$ plane
17	$f(k) = e^{ka}, k \geq 0$	$(1-\frac{e^a}{z})^{-1}$; $\|z\| > \|e^a\|$
18	$f(k) = \begin{cases} 2^k, & k \leq -1 \ldots. \\ (1/2)^k, & k = 0, 2, 4, \ldots \\ (1/3)^k, & k = 1,3,5, \ldots. \end{cases}$	$\frac{2}{2-z} + \frac{4z^2}{4z^2-1} + \frac{3z}{9z^2-1}$; $\frac{1}{2} < \|z\| < 2$
19	$f(k) = \begin{cases} a^k, & k \leq -1 \ldots. \\ (1/b)^k, & k = 0, 2, 4, \ldots \\ (1/c)^k, & k = 1,3,5, \ldots. \end{cases}$	
20	$f(k) = \begin{cases} (1/3)^k, & k \leq -1 \ldots. \\ 0, & k = 0 \\ (1/2)^k, & k \geq 1 \end{cases}$	
21	$f(k) = 2^{\|k\|}, k \geq 0$	$\frac{3z}{[(1-2z)(2z-1)]}$
22	$f(k) = (1/2)^k$, $k \geq 0$	$\frac{3z}{[(2-z)(z-2)]}$
23	$f(k) = \cos k$, $k \geq 0$	$\frac{z(z-cos1)}{z^2-2zcos1+1}$
24	$f(k) = \cos 2k$, $k \geq 0$	$\frac{z(z-cos2)}{z^2-2zcos2+1}$

25	$f(k) = \sin k \ , k \geq 0$	$\frac{z \sin 1}{z^2 - 2z\cos 1 + 1}$
26	$f(k) = \sin 2k \ , k \geq 0$	$\frac{z \sin 2}{z^2 - 2z\cos 2 + 1}$
27	$f(k) = \cos hk \ , k \geq 0$	$\frac{z(z - \cosh 1)}{z^2 - 2z\cosh 1 + 1}$
28	$f(k) = \cos h2k \ , k \geq 0$	$\frac{z(z - \cosh 2)}{z^2 - 2z\cosh 2 + 1}$
29	$f(k) = \sin hk \ , k \geq 0$	$\frac{z \sin h1}{z^2 - 2z\cosh 1 + 1}$
30	$f(k) = \sin h2k \ , k \geq 0$	$\frac{z \sin 2}{z^2 - 2z\cosh 2 + 1}$
31	$f(k) = \sin(k + 1) \ , k \geq 0$	$\frac{z^2 \sin 1}{z^2 - 2z\cos 1 + 1}$
32	$f(k) = 2^k \cos k \ , k \geq 0$	$\frac{z^2 - -2z\cos 1}{z^2 - 4z\cos 1 + 4}$
33	$f(k) = \cos(3k + 2) \ , k \geq 0$	$\frac{z(z\cos 2 - \cos 1)}{z^2 - 2z\cos 3 + 1}$
34	$f(k) = \sin(3k + 2) \ , k \geq 0$	$\frac{z(\sin 1 + z \sin 2)}{z^2 - 2z\cos 3 + 1}$
35	$f(k) = \sin(ak + \frac{\pi}{2}) \ , k \geq 0$	$\frac{z(z - \cos a)}{z^2 - 2z\cos a + 1}$
36	$f(k) = \cos(ak + \frac{\pi}{2}) \ , k \geq 0$	$\frac{-z\cos a}{z^2 - 2z\cos a + 1}$
37	$f(k) = \sin(a + \frac{k\pi}{4}) \ , k \geq 0$	$\frac{z\sin\left[\left(\frac{\pi}{4}\right) - a\right] + z \sin a}{z^2 - \sqrt{2}z + 1}$
38	$f(k) = \left\{\frac{1}{k(k+1)}\right\}$, k>0	$(z-1)\log\left(\frac{z-1}{z}\right)$
39	$f(k) = (k + 1)^2, k \geq 0$	$\frac{z^2(2z + 1)}{(z - 1)^3}$
40	$f(k) = (2k + 5)^2, k \geq 0$	
41	$f(k) = 2^k(k + 1)^2, k \geq 0$	
42	$f(k) = e^{-5k} \cos(ak + \frac{\pi}{2}) \ , k \geq 0$	
43	$f(k) = k^2 4^k, \ k \geq 0$	
44	$f(k) = (1/2)^k * (1/4)^k \ , k \geq 0$	
45	$f(k) * g(k)$ where $f(k) = \sin 2k \ , g(k) = k^2 \ , k \geq 0$	
46	$f(k) = c^k$ using $Z\{1\}, k \geq 0$	
47	$f(k) = k^3$ using $Z\{1\} \ , k \geq 0$	
48	$f(k) = c^k$ and hence for c^{k-1}, c^{k+1}	
49	$f(k) = \sin k \ , k \geq 0$ & *hence* $\sin(k + 1)$	
50	$f(k) = \sin 2k \cos 2k \ , k \geq 0$	
	Find Inverse Z-Transform of the following	
51	$\frac{1}{z - 1}$, $\lvert z\rvert < 1, \quad \lvert z\rvert > 1$	$-1, \ k \leq 0 \ ; \ \ 1, k \geq 1$
52	$\frac{z}{z - 1}$, $\lvert z\rvert < 1, \quad \lvert z\rvert > 1$	$-1, \ k < 0 \ ; \ \ 1, k \geq 0$

53	$\frac{1}{z-3}$, $\|z\|<3$, $\|z\|>3$	-3^{k-1}, $k\le 0$; 3^{k-1} , $k\ge 1$
54	$\frac{z}{z-a}$, $\|z\|<a$, $\|z\|>a$, $a>0$	$-a^k$, $k<0$; a^k , $k\ge 0$
55	$\frac{1}{(z-1)^2}$, $\|z\|<1$, $\|z\|>1$	$-k+1$,, $k\le 0$; $(k-1)$, $k\ge 2$
56	$\frac{1}{(z-5)^2}$, $\|z\|<5$, $\|z\|>5$	$\frac{-k+1}{5^{-k+2}}$,, $k\le 0$; $(k-1)5^{k-2}$, $k\ge 2$
57	$\frac{1}{(z-3)^2}$, $\|z\|<3$, $\|z\|>3$	$\frac{(-k+1)(-k+2)}{2(3^{-k+3})}$, $k\le 0$; $\frac{(k-2)(k-1)}{2}(3^{k-3})$, $k\ge 3$
58	$\frac{1}{(z-1)^3}$, $\|z\|<1$, $\|z\|>1$	
59	$\frac{z}{(z-2)(z-3)}$, $\|z\|<2, 2<\|z\|<3, \|z\|>3$	
60	$\frac{1}{\left(z-\frac{1}{2}\right)(z-1/3)}$, $\frac{1}{3}<\|z\|<\frac{1}{2}, \|z\|>1/2$	
61	$\frac{z^3}{(z-1)(z-2)^2}$, $\|z\|>2$	
62	$\frac{z^3}{(z-1)(z-2)^2}$, $\|z\|>3$	
63	$\frac{1}{(z-5)^2}$, $\|z\|<5$, $\|z\|>5$	
64	$\frac{z}{(z-1)(z-3)}$, $\|z\|<1, 1<\|z\|<3$	
65	$\frac{1}{(z-2)^3}$, $\|z\|<2$, $\|z\|>2$	
66	$\frac{2z^2+3z}{z^2-z+1}$, $\|z\|>1$	$\frac{8}{\sqrt{3}}\sin\frac{\pi k}{3}+2\cos\frac{\pi k}{3}$, $k\ge 0$
67	$\frac{2z^2+3z}{z^2+z+1/9}$, $\|z\|>\frac{1}{3}$	$2(-1/3)^k\cos h\, ak - \frac{12}{\sqrt{5}}(-1/3)^k\sin h\, ak, k\ge 0$
68	$\frac{2z^2+3z}{z^2+z+1/16}$, $\|z\|>2+\sqrt{3}$	$2(-1/4)^k\cos h\, ak - \frac{16}{\sqrt{3}}(-1/4)^k\sin h\, ak, k\ge 0$
69	$\frac{z^2+z}{z^2+z+1}$, $\|z\|>1$	$\frac{1}{\sqrt{3}}\sin\frac{2\pi k}{3}+\cos\frac{2\pi k}{3}$, $k\ge 0$