11.9.5-13

EE23BTECH11033-killana jaswanth

question:

$$\frac{a+bx}{a-bx} = \frac{b+cx}{b-cx} = \frac{c+dx}{c-dx} \tag{1}$$

then show that a,b,c,d are in G.P

solution:

parameter	description	value
$x(0)$	first term	a
$x(1)$	second term	b
$x(2)$	third term	c
$x(3)$	fourth term	d
r	common ratio	$\frac{b}{a}$
n	no of terms	4
$x(n)$	(n)th term	$x(0)\,r^n$

TABLE 0: input parameters

$$\frac{x(0)+x(1)\,x}{x(0)-x(1)\,x} = \frac{x(1)+x(2)\,x}{x(1)-x(2)\,x} \tag{2}$$

$$x(0)\,x(3)\,x = x(1)^2\,x \tag{3}$$

$$\implies x(1)^2 = x(0)\,x(2) \tag{4}$$

$$\frac{x(1)+x(2)\,x}{x(1)-x(2)\,x} = \frac{x(2)+x(3)\,x}{x(2)-x(3)\,x} \tag{5}$$

$$x(1)\,x(3)\,x = x(2)^2\,x \tag{6}$$

$$\implies x(2)^2 = x(1)\,x(3) \tag{7}$$

x(0),x(1),x(2) are in G.P and x(1),x(2),x(3) are in G.P
So, x(0),x(1),x(2),x(3) are in G.P
Applying z-transform

$$X(z) = \frac{x(0)}{1-rz^{-1}} \quad |z| > |r| \tag{8}$$

$$X(z) = \frac{a^2}{a-bz^{-1}} \quad |z| > \left|\frac{b}{a}\right| \tag{9}$$

$$X(z) = \frac{x(0)^2}{x(0)-x(1)\,z^{-1}} \quad |z| > \left|\frac{x(1)}{x(0)}\right| \tag{10}$$