11.9.5.3

EE23BTECH11062 - V MANAS

Question:
Let the sum of $n, 2n, 3n$ terms of an AP be S_1, S_2 and S_3, respectively, show that $S_3 = 3(S_2 - S_1)$
Solution:

Variable	Description
x(0)	First term of AP
d	common difference in the AP
n	number of terms in AP
S_k	sum of k_n terms the AP

TABLE I
Variables Used

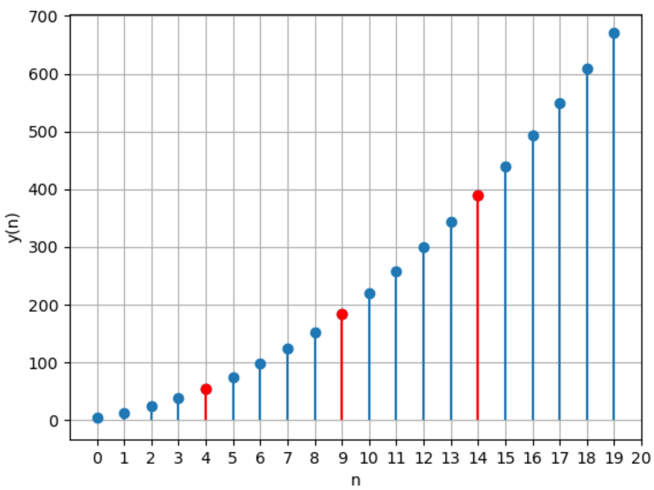

Fig. 1. Verification plot for the given equation

By equation(**??**)

$$\implies S_1 = \frac{n+1}{2}(2x(0) + nd)u(n) \tag{1}$$

$$\implies S_2 = \frac{2n+1}{2}(2x(0) + 2nd)u(n) \tag{2}$$

$$\implies S_3 = \frac{3n+1}{2}(2x(0) + 3nd)u(n) \tag{3}$$

$$\implies RHS = 3(S_2 - S_1)$$

$$RHS = 3(\frac{2n+1}{2}(2x(0) + 2nd)u(n) - \frac{n+1}{2}(2x(0) + nd)u(n)) \tag{4}$$

$$= \frac{3n+1}{2}(2x(0) + 3nd)u(n) \tag{5}$$

$\therefore$ LHS=RHS shows that $S_3 = 3(S_2 - S_1)$
Now let we take an AP for verification,
Whose x0(initial term)=5,d(common difference)=3
$\implies$ sum of first 5 terms of the AP[y(4)]=55
$\implies$ sum of first 10 terms of the AP[y(9)]=185
$\implies$ sum of first 15 terms of the AP[y(14)]=390
RHS=3(y(9)-y(4))=390
$\implies$ y(14)=3(y(9)-y(4))