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Some Bi-Recurrent Properties of Weyl Space

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Abstract:
In this paper, we have studied the bi-recurrent properties of Weyl conformal curvature tensor, Weyl projective curvature tensor and Weyl concircular curvature tensor and some relation between them has been established.
Keywords: Weyl space, bi-recurrent space, curvature tensor.

1. Introduction: An n-dimensional differentiable manifold W_n is said to be Weyl space if it has a conformal matric tensor g and a symmetric connection ∇ satisfying the condition [6], [8], [10],

$$\nabla_k g_{ij} - 2T_k g_{ij} = 0 \tag{1.1}$$

where T_k denotes a covariant vector field.
The above equation can be extended to

$$\partial_k g_{ij} - g_{hj}\Gamma^h_{jk} - 2T_k g_{ij} = 0 \tag{1.2}$$

where Γ^h_{jk} are the connection coefficients of symmetric connection ∇ and are defined as

$$\Gamma^h_{jk} = \left\{ \begin{array}{c} h \\ jk \end{array} \right\} - g^{hm}(g_{mj}T_k + g_{mk}T_j - g_{jk}T_m) \tag{1.3}$$

under the renormalization condition

$$\tilde{g}_{ij} = \lambda^2 g_{ij} \tag{1.4}$$

of the metric tensor g_{ij}, the covariant vector field T_k is transformed by the law

$$\tilde{T}_k = T_k + \partial_k I_{n\lambda} \tag{1.5}$$

where λ is a scalar function defined W_n. We denote such a Weyl space by $W_n(\Gamma^h_{jk}, g_{ij}, T_k)$ or $W_n(g, T)$.
Let

$$R(X,Y)Z = \nabla_X\nabla_Y Z - \nabla_Y\nabla_X Z - \nabla_{[X,Y]Z} \tag{1.6}$$

denote the curvature tensor associated with the connection ∇.

A non-flat Weyl space is called recurrent if its curvature tensor R satisfies

$$(\dot{\nabla}_u R)X, Y, Z = \phi(u)R(X,Y,Z) \tag{1.7}$$

where ϕ is a non-zero 1- form of weight zero and $R(X,Y,Z)$ is the curvature tensor of type (1,3) [2].