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A note on semi convex set under transformation, (n & s condition)

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Abstract
The object of this work is to obtain a result on the transformation of a Semi Convex Set to Semi Convex Set.

Keywords: Simmon, Hovarth, semi convex set

Introduction
In This paper the efforts has been made to make a study of the transformation of Semi Convex Set. In order to do this we establish here results on transformation of a Semi Convex Set analogous to that for the transformation of a linear space.

Definitions: For definitions refer to Simmons, (1) and Hovarth, (1). However we give below some of the definition to serve as ready reference.

Convex Set: Let S be a non empty subset of a linear space E. Now if for x,y€ S and α, β≥ O, S is called a Convex Set whenever,

$\alpha x + \beta y \in S$ for $\alpha + \beta = 1$

Semi Convex Set: Let C be a non empty subset of a linear space E. Now if x, y € C and α, β ≥ 0 then we shall say that C is a Semi Convex set whenever,

$\alpha x + \beta y$ is in C for $\alpha + \beta \leq 1$

Linear Transformation: Let E and E' be any two linear spaces (over the field K).
A mapping T: E → E' is called a linear transformation if the following condition are satisfied.
i) T(u+v) = T(u) + T(v), for every u,v are in E
ii) T(α u) = α T(u) for every u in E and α is in K.

Here conditions (i) and (ii) can be together expressed as
$T(\alpha u + \beta v) = \alpha T(u) + \beta T(v)$, for every u, v in E and α, β in K.

Here a linear transformation is also called a linear mapping. It is easy to see that 0
T(0) = T(0.0) =0 T(0) = 0
T(-x) = T((-1)x) = (-1) T (x) = - T (x), for every x in E.

That is, a linear transformation T of a linear space E into a linear space E' preserves the origin and negatives.
We give a few results with the notions of a linear transformation and Semi Convex Set given in the above section.
Let (i) E and E' be any two linear spaces (over a field K).
(ii) T: E →E' be a linear transformation from E into E'.

(iii) A and B be any two Semi Convex sets in E.

Then to prove that,

A ⊆B ⇒T(A) ⊆ T(B)

Proof: Since A is a Semi Convex Set in E then T(A) is contained in E'. B is a Semi Convex Set in E then T(B) is contained in E'.
Let Z1, Z2 are in T(A) then ∃X1 and X2 in A such that,

Z1 = T(X1) Z2 = T(X2)

Clearly X1, X2 are in B also (by hypothesis)

Also, α X1 + βX2Є A ⇒αX1 + βX2Є B for α, β≥ 0 and α + β ≤ 1 (1)

Now, αZ1 + βZ2 = α T(X1) +β T(X2)
= T(α X1 + β X2) Є T(A)

Thus, α Z1 + β Z2 Є T(A) (2)

Thus, T(A) is a Semi Convex
But by (1) we can show that αZ1 + βZ2 = T(αX1 + βX2) Є T(B) (3)

For X1, X2 Є A ⇒X1, X2Є B and α, β≥ 0 and α + β≤ 1

Thus, T(B) is also Semi Convex Set.
Also by (2)

AZ1 + βZ2ЄTA, for Z1, Z2Є T(A), for α, β≥ 0 and α + β≤ 1

AZ1 + βZ2Є T(B) and T(B) is a Semi Convex Set.

Thus for α, β ≥ 0 and α + β ≤ 1, Z1, Z2 must be in T(B)

Thus Z1, Z2 Є T(A) ⇒Z1, Z2Є T(B)

Hence, T(A) ⊆ T(B)

Thus, the theorem is proved that, A ⊆B ⇒ T(A) ⊆ T(B).

Corollary: Let
i) E and E' be any two linear spaces (over a field K)
ii) T: E →E' be a linear transformation from E into E'.
iii) A and B be any two Semi Convex Set in E.

Then prove that A = B ⇒ T(A) = T(B).

Proof: It direct follows from the fact of the above theorem that under the set conditions laid down in the corollary.

A ⊆B ⇒ T(A) ⊆ T(B)

But then A ⊆ B ⇒T(B) ⊆ T(A).

Thus A = B ⇒ T(A) = T (B).

Thus, the corollary is established.

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