Geometric And Analytic Properties Of The Generalized Inverse

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In our research We have discussed the definition and the properties of the pseduoinverse , also the geometric and the analytic properties of the pseduoinverse were discussed in details to use them in the applications for the least square solution ,the best linear unbiased estimation (BLUE) and the proof of Gauss-Markov theorem in statistics .

The pseduoinverse of any matrix A_{mn} is given as a matrix X_{nm} that satisfies the following properties :

- AXA=A
- XAX=X
- $(AX)^T$=AX
- $(XA)^T$=XA

The importance of the pseduoinverse comes from the least square solution ,as we want to show in part two ,that's x_0 minimizes

$$|z - Hx|^2$$

if and only if x_0 is of the form

$$x_0 = H^+ z + (I - H^+ H)y$$

for some y .(H^+ : the pseduoinverse of H)

At the end of this research we used the pseduoinverse properties to discuss the best linear unbiased estimation (BLUE) which has many applications in the applied science .