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LINEAR TRANSFORMATION is any rigid transformation in space which can be represented by the successive performance of pure translations and pure rotations.

- Thereom: #1 Every linear transformation can be represented by a matrix.
 - # 2 Every matrix represents a linear transformation.
 - #3 If the determinant of a matrix is different from zero, the transformation is non-singular and has an inverse. The matrix of the inverse transformation is the adjoint of the original matrix with every element divided by the value of the determinant.

Cryptographical Application:

Represent plain text in units of fixed length as a series of vectors. (A vector is any ordered set of numbers of fixed length). Dailey Key consists of a series of substitutions which will transform the plain text into a vector and a non-singular matrix having as many rows and columns as the vector has elements. Each vector in turn is multiplied on the right by the matrix and the result is always a vector. Another series of substitutions is provided to change the resulting vector to cipher text. Deciphering is accomplished in the same way using the inverse substitution and inverse matrix.

- Note 1. A self reciprocal matrix is its own inverse.
 - 2. Instead of using a single matrix, a matrix polynomial can be used.

Lester H. Hill: American Mathematical Monthly for Sept.? 1929 and 1930.

Dr. H. Campaigne