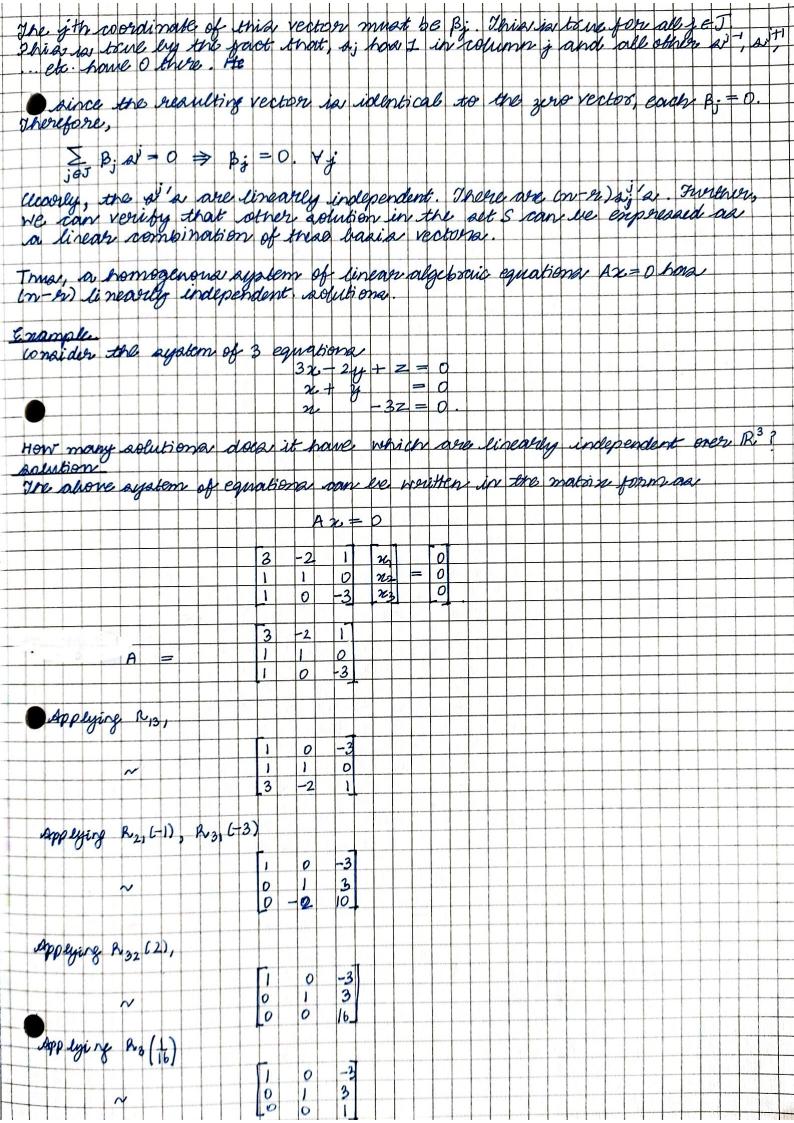
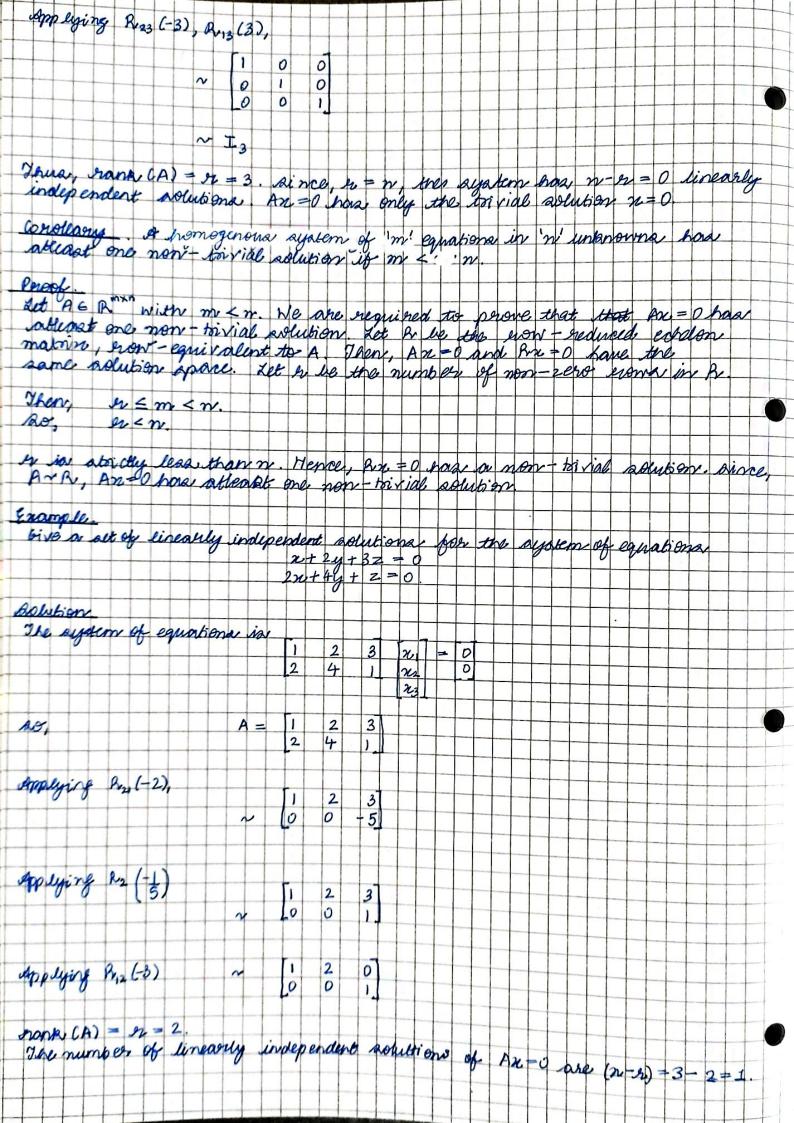
Thus A is invertible One-sided invertibility over a square motor implies invertibility Homogenous system of equations Definition. any system of the sperm is called a homogenous system of linears algebraic equations. Let R be the non-reducted echelon from of the matrix A set i = 1, 2, 3, ..., be the non-zero wome of R. Let c, c, c, c, be the column numbers in which the first leveling non-zero entry of the gons i = 1, 2, ..., in occurs. As R is now-reduced cohelon matrix of A, c, < c, ... < cr These are the equationa corresponding to the first or name of Pr. = 0 acz + D az zcj non t E ani rij the other equations ofon't appear, because they correspond to now nows we can be on assign andivorry values to the x; a, y \in J. These wife in called free-variables (parameters) of In particular, if we a Assigning and transfer aluse to n; j \in J, the values of to, xc; xc, con ele obtained. In particular, if n < n, there is a bleast one pret variable. Thus, if n < n by assigning one of the nije, the value unity, while setting all other to, as your (n-n-1) free variablese zino, we get on non-zero (non-toivial) delution for A x = 0. Therefore, if n < n for a nomogenous system of equations, the system has attempt one non-toixial solution swether, it h = R" and evant (A) = size (A) = n, then $R = I_n$. principal diagonal entrica are zero. R = It is easy to infor, that the only non-reduced extern matrix, whose non-zero Theorem 19. The number of dinearly imperent solutions of a homogenous of system of equations Ax = 0 is (n-e). The dimension of the solution operate of the promogenous egos system Ax = 0 is (n-v) whenomes that represent to the columns and con con

Remember, a, a, an represent the columns in which the first non-zero element is in non 12, ..., In. The agracion of equationa Rx-0 can be expanded in the full form and xu, + \(\sigma \arg \) xi $x_{i_2} + \sum_{j \in J} \alpha_{i_j} x_j = 0$ $x_{cn} + \sum_{j \in J} x_{nj} x_j = 0$ The carolinality of Jia (n-r) We look at the variables x_i , $j \in J$ we assign arbitrally values to them. These are the free variables. If we are stirtly them in the aliene equation, we get x_{ij} , x_{i Let we denote a solution vertice as si; jet. si is the solution vector, which has its jet roordinate u; = 1, and all other free variables set to zero. We are looking at one specific assignment for the free variables. $x_i = 0$, $j \in \mathcal{T}$, $i \neq j$. I take the first je J, set n: =1. I act all other entries x: =0, ieJ, i = j. We then substitute thise values in the system of equations and find talues of ne, ne, ne, ne, we fill these natures up in sij. No repeat whise procedure por each j & T we get (n-r) solution verto has, sija. Each a; is a ablution of RX = 0 and here since A ~ R, it is a ablution of An = 0. so, each si belongs to the ablution space S. much like the standard basia vectora e, e, , en in R", each it we for a minute forget object the vociables ac, 20, 20, 20, each si could be the Non Hop gust like the atandard lead a vectora, each ai will have ita jthe coordinate and all other some variables of air will have a I is the (3-1) the coordinate and all other free variables zuron. Agrume By at = 0 vectors.





The eguivalent agreem of equations is 2, + 2 22 Inearly independent solution of the given aystem of equations. 1.5 Non-homogenous system of Linear equations.

A system of equations Arc = b, where the right side b + 0 is solled a non-homography agatem of linear algebraic equations. The expension difference between a somogenous system and a non-homogenous system in that a non-somogenous system need not some a solution. Consider Ax = b, $A = \mathbb{R}^{m \times n}$, $x = \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix}$, b is requirement vector, $b = \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix}$ Let A' = (A, b) We adjoin the matrix b We apply elementary now operational we know that, if (A, d) is obtained by applying elementary now operational to (A, b), then any solution of Ax=0 is a solution of Ax=d and vice vonaa. Let use white Rxx = de in the expanded form $\frac{\chi_{G}}{f} + \frac{\chi_{G}}{f} = \frac{\chi_{G}}{f} + \frac{\chi_{G}}{f} + \frac{\chi_{G}}{f} + \frac{\chi_{G}}{f} = \frac{\chi_{G}}{f} + \frac{\chi_{G}}{f} +$ 262 + 5 0 2j 2j = recent jes and ris = don What about the other (mo en) equations if In the homogenous case, these (m-n) equations don't contribute anything on post any constraint. But, for a non-homogenous system, the last (m-n) zero wome of R, determined if the system has a solution or does not have a solution. Ine east (m n) equational are: 0 = dente 0 = dm Thur, Ax the have or whition if The d'a are zero in the normogenous corse. di +0, 4+1 & i s m.