Problem 8.

```
function [inverse] = GEpivinv(A)
[n,n] = size(A);
I = eye(n,n);
piv = 1:n;
tic
for k=1:n-1
    [maxv,r] = max(abs(A(k:n,k)));
    q = r+k-1;
    piv([k q]) = piv([q k]);
    A([k q],:) = A([q k],:);

I([k q],:) = I([q k],:);
    if A(k, k) \sim 0
         A(k+1:n,k) = A(k+1:n,k)/A(k,k);
         A(k+1:n, k+1:n) = A(k+1:n, k+1:n) -A(k+1:n, k) *A(k, k+1:n);
         I(k+1:n,1:n) = I(k+1:n,1:n) -A(k+1:n,k)*I(k,1:n);
    end
end
```

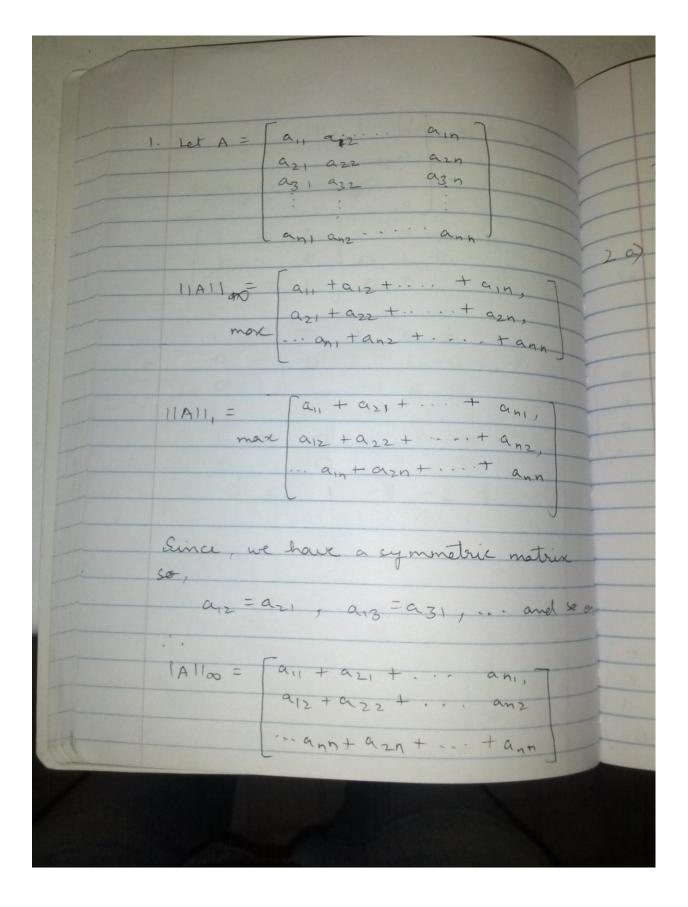
```
for k=2:n
    if A(k,k) ~= 0
        A(1:k-1,k) = A(1:k-1,k)/A(k,k);
        A(1:k-1,k+1:n) = A(1:k-1,k+1:n) -A(1:k-1,k)*A(k,k+1:n);
        I(1:k-1,1:n) = I(1:k-1,1:n) -A(1:k-1,k)*I(k,1:n);
    end
end

for k = 1:n
    I(k,1:n)=I(k,1:n)/A(k,k);
end

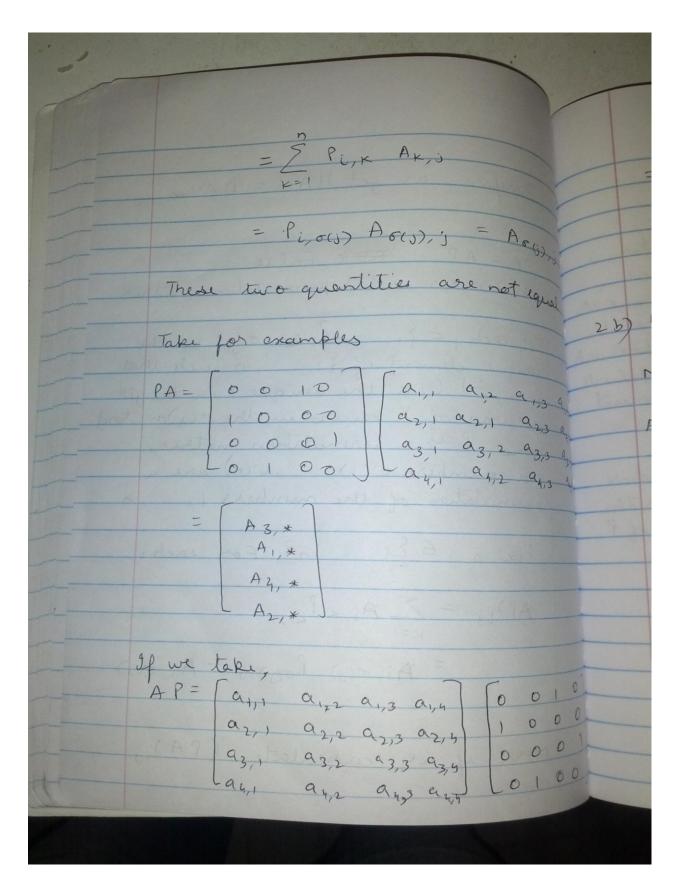
toc
L = eye(n,n) + tril(A,-1);
inverse = I;
U = triu(A);
```

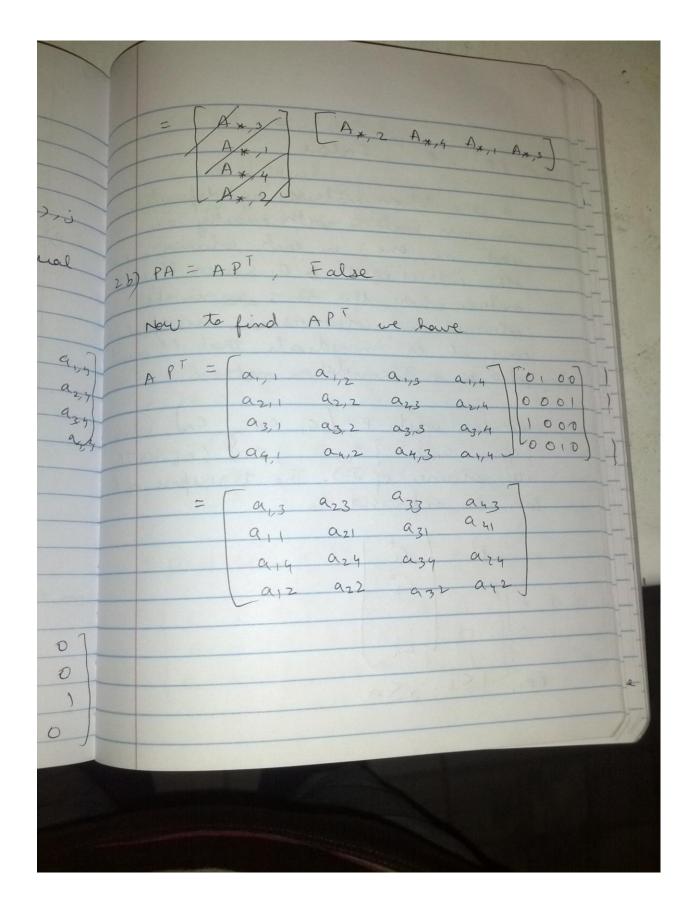
Problem 11.

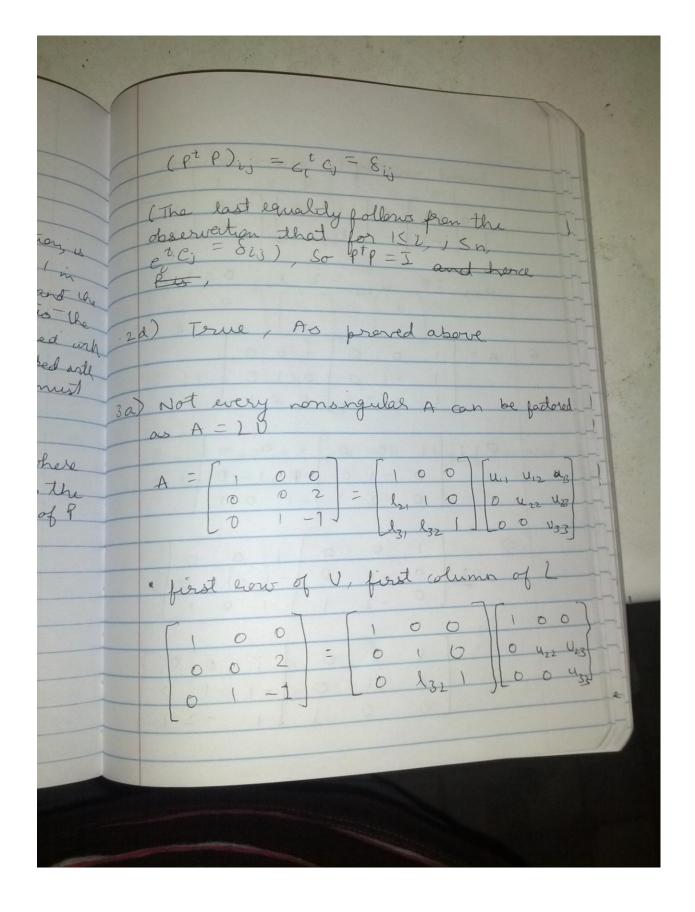
```
function [X]=HW6_Problem5(A,b,x0)
D = tril(A) - tril(A, -1);
xl=inv(D)*b - inv(D)*((A-D)*x0);
N=1;
M1 = norm(inv(D)*(A-D),1);
M2 = norm(inv(D)*(A-D),1);
Minf = norm(inv(D)*(A-D),1);
Mnorm = min(M1,min(M2,Minf))
if Mnorm < 1
    while N>10^-5
       x0=x1;
       xl=inv(D)*b - inv(D)*((A-D)*x0);
       n1=norm(x1-x0,1);
       n2=norm(x1-x0,2);
       ninf=norm(x1-x0,inf);
       N=min(n1,min(n2,ninf));
   end
end
X=x1;
```

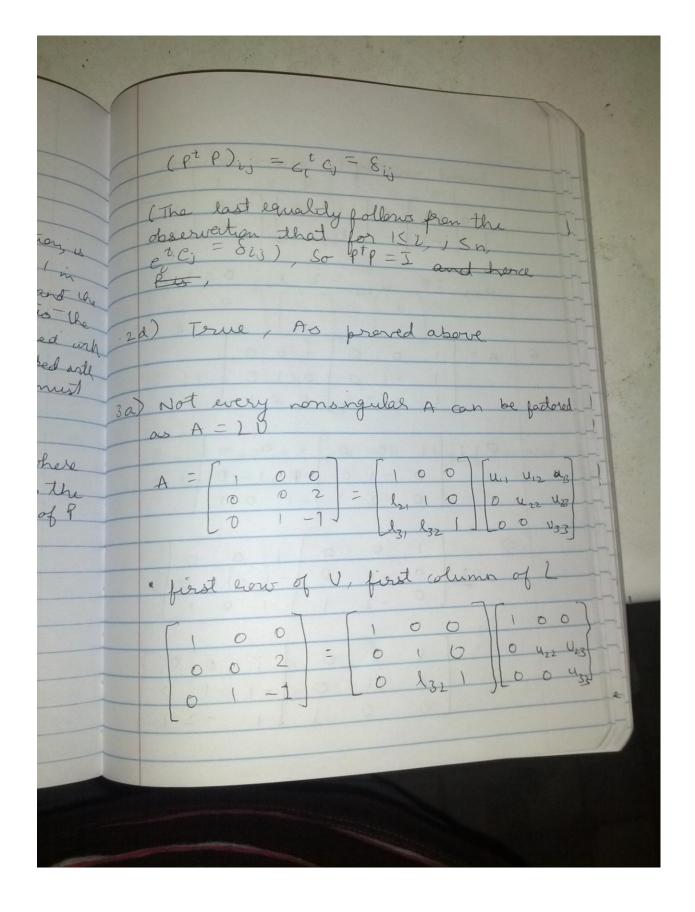


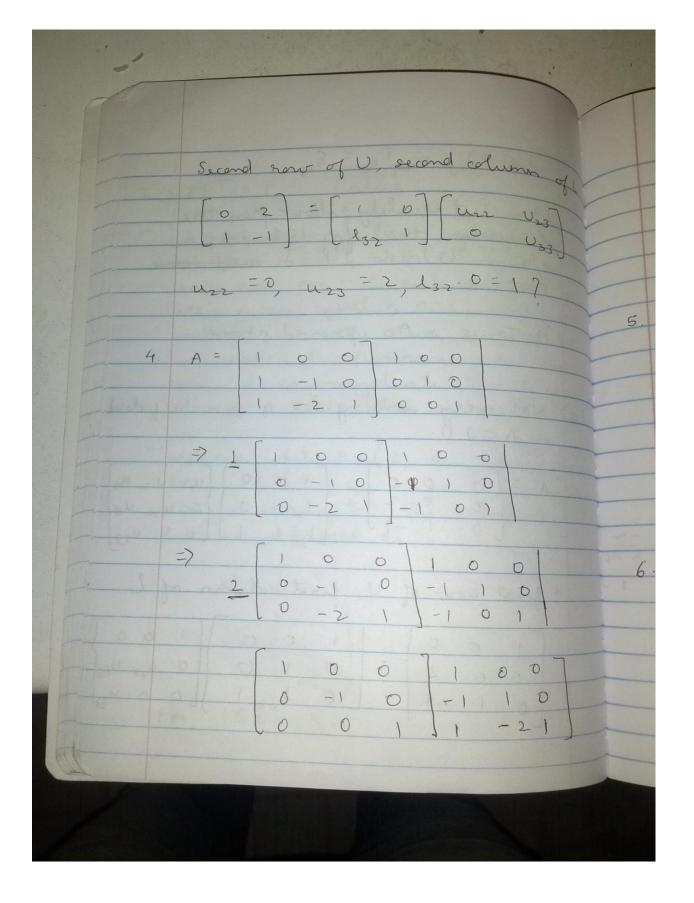
Therefore, we get 1/A1/ = 1/A1/20 a) PA = AP, TRUE False A > n × n, P =) permitation matrix For each j & {1, ..., n}, let $\sigma(j)$ be the unique element of {1, ..., n} such that $l_{\sigma(j)} = 1$ (i.e., the unique 1 in the jth Column of X occurs in the o () the sou) Since P is a permutation matrix, the numbers o(1), ..., o(n) are a permutation of the numbers 1, ..., n Fixe a j E & 1, ..., n & For each i, (AP) is = Z ALIKPKIS = Ai, 0(3) Po(3); = Ai, 0(3) Now, if we canculate (PA)is

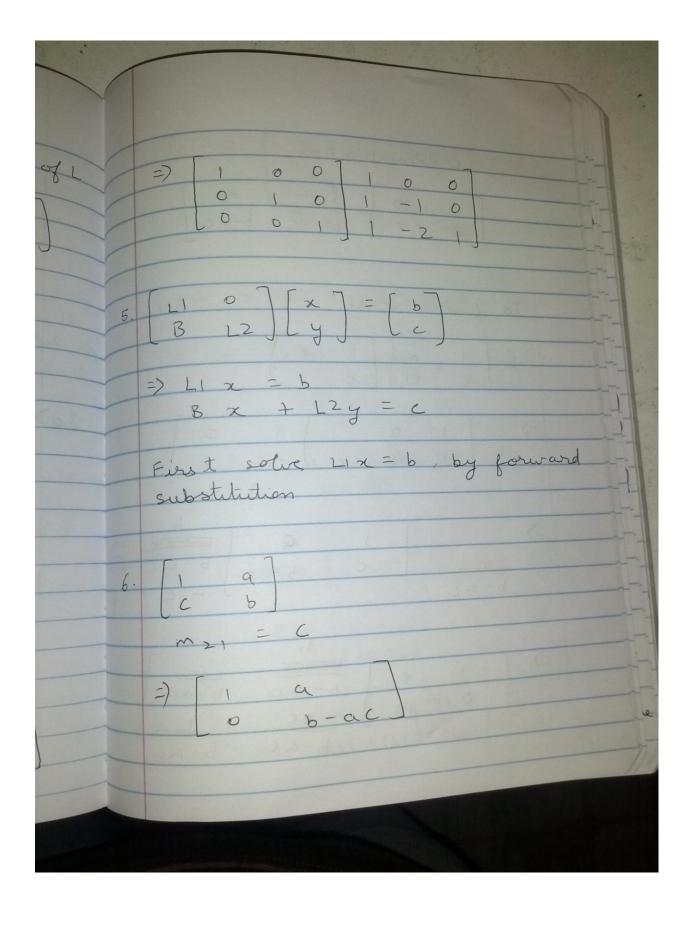


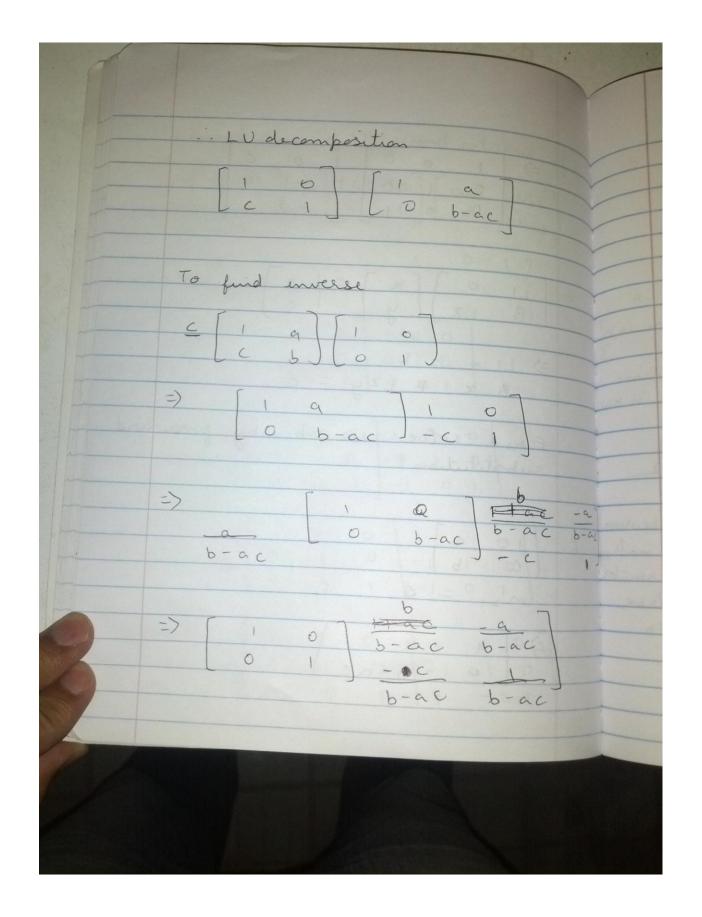






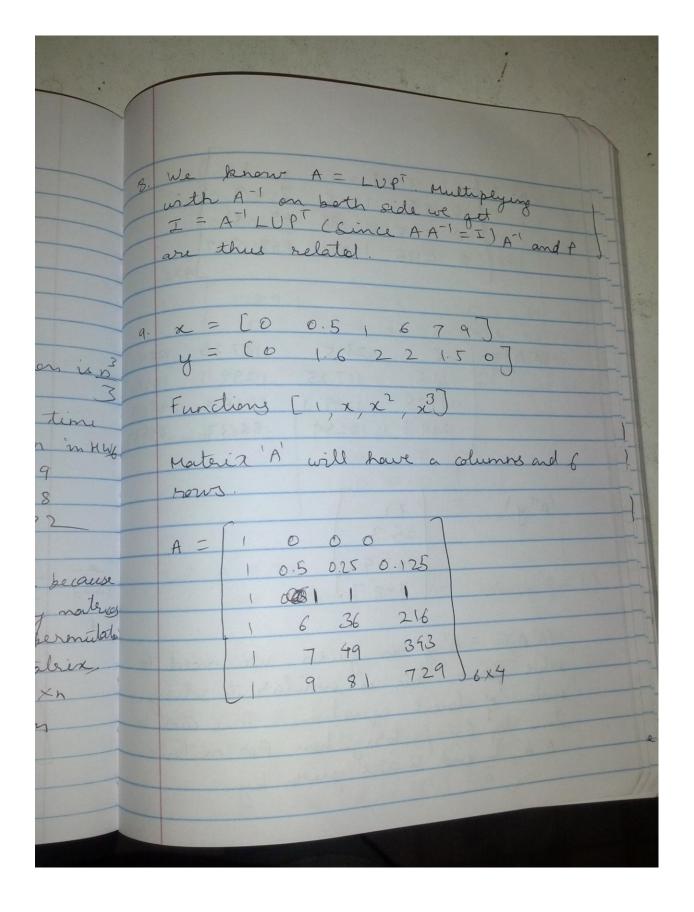




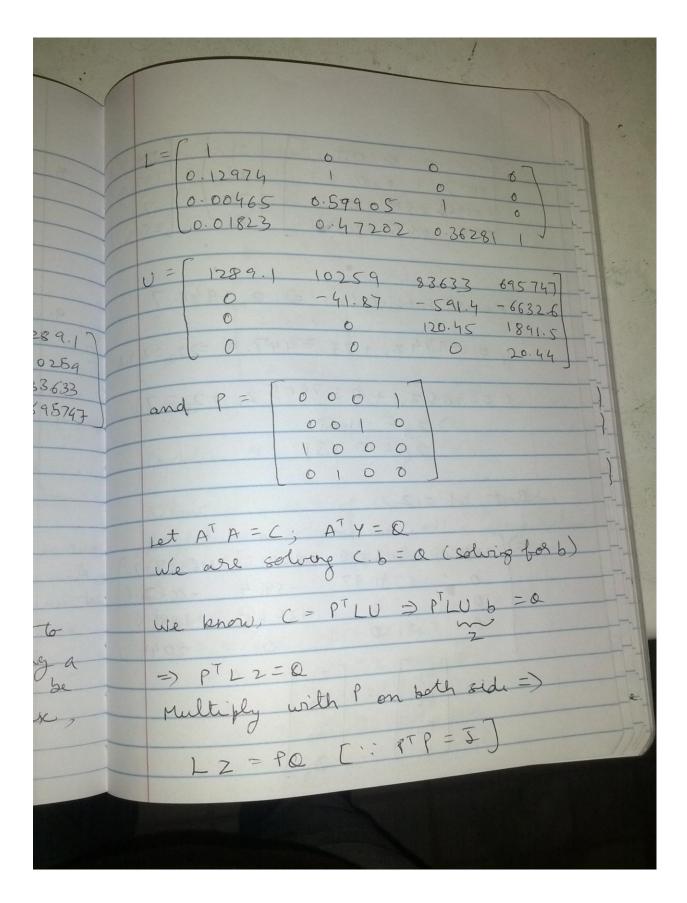


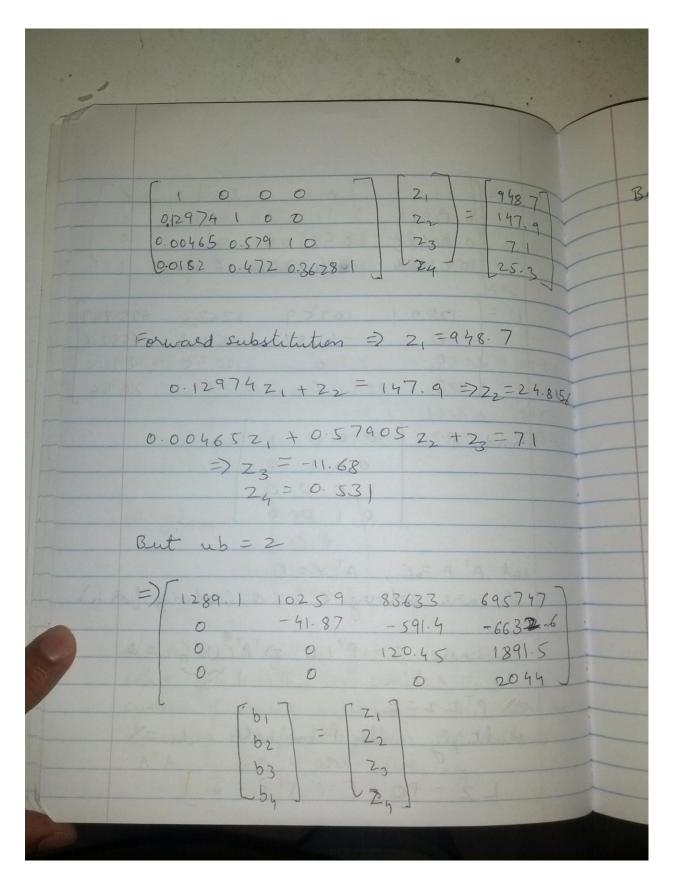
b-ac 11A1100 = max { 1 Hal, 161 Hal} 11A-11/go = max { 16/41; 11-16/3 16/40) The matrix is singular |A| = 0, b-ac = 0; b = ac (1A1), = Max { 1+1cl, 1a1+1b} 6-01 (A-1) = Max (1b+1c), 1a+1 (1b-ac) 1b-ac) Cond (A, 1) = || A 11, 1/A-11, Man [1+1c], 1a1+1b1] x Max [1b1+1c], 1a1+1 [1b-ac] [1b-ac]

Cond (A, D) = (1A) 100 11A-1100 = Man[1+ |al, |d | + |c|] x Mare [101 +161 , 1+161 - 16-001 7. The complexity of LV factorization is Elapsed time Elapsed time n=200 0.025 code given in HW7 code given in HW 0.239 n=400 0.020 2.208 $n = 800 \quad 0.070$ 23.672 There is a difference in slapsed time because cade submitted by me uses temporary matrix it to store multiplier. Also, the permits matrix in our matrix is nxn matrix. where as the code given uses a 1 xn vector to keep track of permutation



T-C1
AT = 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
0 0.25 1 36 49 81
0 0.125 216 343 729
J4x6
(17.0.)
$(A^{T}A) = 6$ 23.5 167.25 1289.
23.5 167.25 (289.1 (025q 167.25 (289.) 1025 q 83633
1289. 10259 83633 698747
1374
$(A^Ty)_{4\times 1} = 7.1$
25.3
147.9
[948.7]
- Alexander de la laction de laction de laction de laction de laction de laction de la laction de lactio
(ATA) b = ATy is given. We need to
solve for b. This is similar to solving a
system of linear equations. This can be
done by LU factorization. For matrix, ATA, I and U are given by.
ATA, Land Vare given by.



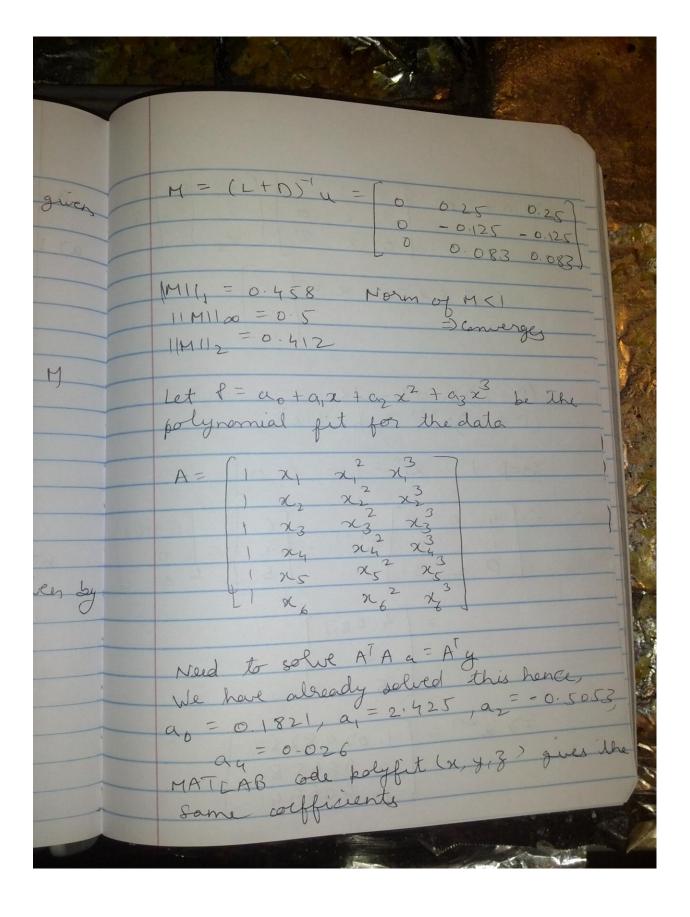


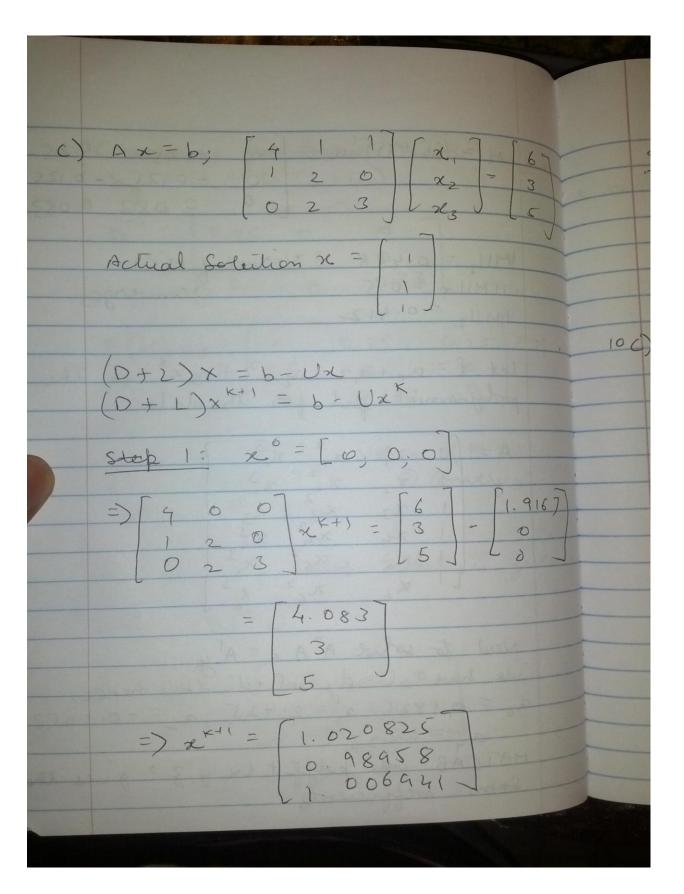
48 77 47.9	Backward substitution by = 24 = 0.026 b3 = -0.5033 b2 = 2.425 b, = 0.1821
24.815%	$\begin{array}{c} 2.5 = 0.021 \\ 2.425 \\ -0.5053 \\ 0.026 \end{array}$
47	Below is output of the use of functions polyfit and polyval as well a computation of RMSE and absolute errors.
.5	Error Calt P = 0-026003853661861 -0-50J350102396800 2-425733973577638 0-182139732490656

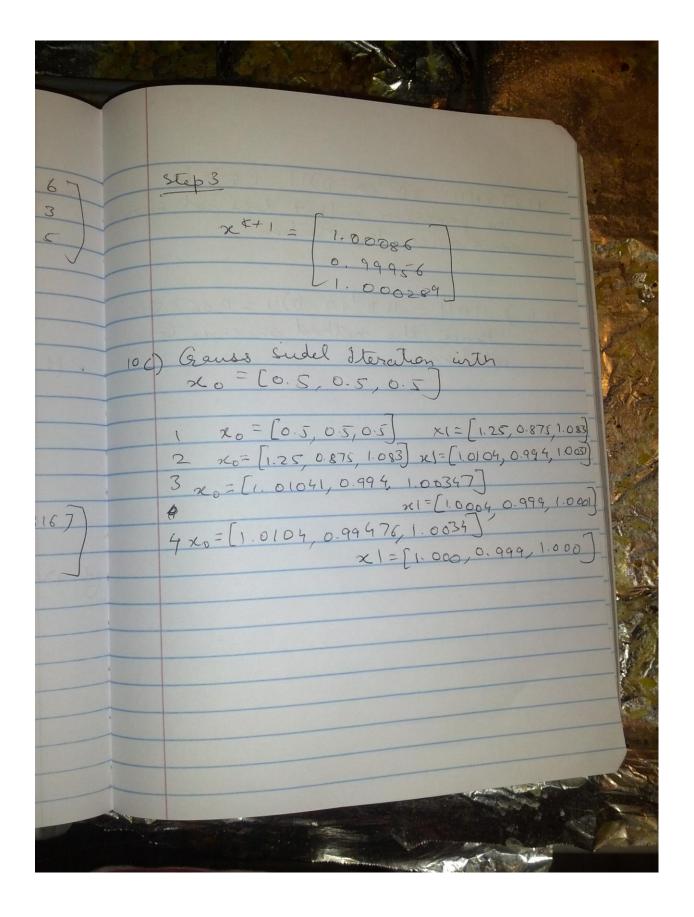
RMSF = 0.466007 Proble Absolute Error = 1.017271977005601 MATLAB code: Error calc m $x = [0 \ 0.5 \ 1679];$ $y = [0 \ 1.6 \ 2 \ 2 \ 1.5 \ 0];$ P = polyfit (x, y, 3) Y = polyval (P, x) Sum RMSE = 0 sun Erroy = 0 for i = 1:6 Sum RMSE = Sum RMSE + (Yw) - yw) sum Error = Sum Error + abs (Y(i) - yil). RMSE = sgrt (Sum RMSE)
Absolutioner = Sum Erros.

Roblem 10 a) let X denote the solution of Ax=b
i.e, Ax=b=) X=A-1b Let there be another solution denoted by Y, i.e. $Y = A^{-1}b$. Introduce R = X - Y the differences between the solutions $A^{-1}b - A^{-1}b = D$ i.e., for any A, there exist a urique solution for x > Ax=b 6) FOR A= + 0 0 0 + 1 + 0 1 1 guil 6000

Convergence for Gauss Jacobi is given by $M = D^{-1}(L+U)$ D-1 = [0.28 0 0 0 0.5 0 0 0 0.33 D(1+v) = 0 0.25 0.25 = M 0.5 0 0 0 0.667 0 11M11, = 0.9167 Norm of M <1 11M1100 = 0.667 =) Converges 11M11 = 0.718 Convergence of Gauss-Siedel is given by M= (L+D) U $(L+D)^{-1} = \begin{bmatrix} 0.25 & 0 & 0 \\ -0.125 & 0.5 & 0 \end{bmatrix}$ LO-08 -0-33 033







11 () IIMII = 11 D -1 (A - D) 11 = 1.5 > 1 The program output does not show, convergence to solution Hence the nethod converges to solution