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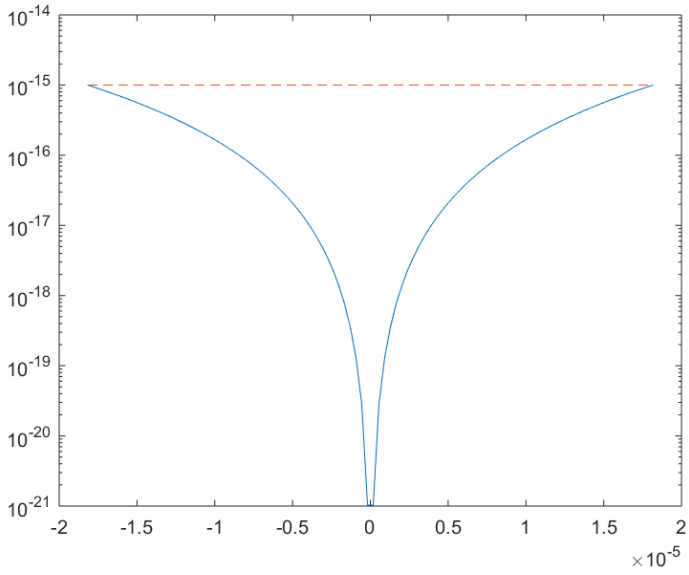
PLOT for 3



gauss.m code:

```
function A = gauss(A)
    s = size(A);
    s = s(1);
    U = A;
    L = eye(s);
    for i = 1:s-1


       for j = i+1:s
          a = -U(j,i);
          b = U(i,i);
          if a~=0 && b~=0
             fact = a/b;        %% multiplication factor
             U(j,:) = fact*U(i,:) + U(j,:);
             L(j,i) = -fact;
          end
       end
    end
    A = L - eye(s) +U;
end
```

gauss_p.m code:

```
function [A l] = gauss_p(A)
   s = size(A);
   s = s(1);
   U = A;
   A1 = A;
   L = zeros(s);

   scal = max(abs(U),[],2);      %make scale
   l = 1:1:s;                    %index array


   for i = 1:s-1
      check = abs(A1(:,i))./scal;
      [~,piv] = max(check());      %index to swap
      ind = find(l == piv);
      A1(piv,:) = [0];             %% 0 row
      l([ind i]) = l([i ind]);    %swap


      for j = i+1:s %%%%%%%row reduce%%%%%%%%
         ni = l(i);
         nj = l(j);          %% use l as hash table
         a = -U(nj,i);
         b = U(ni,i);

         if a~=0 && b~=0
            fact = a/b;
            U(nj,:) = fact*U(ni,:) + U(nj,:);
```

```
            L(nj,i) = -fact;
        end
    end
end
P = zeros(s);
cnt = 1;
for i = l
    P(cnt,i) = 1;
    cnt = cnt + 1;
end

%%L = P+L;
%%L = P*L;
%%U = P*U;
A = L +U;
end
```

backward code:

```
function x = backward(A,b,l)

s = size(A);
s = s(1);

for k = 1:s-1
    for i = k+1:s
        ni = l(i);
        nk = l(k);
        b(ni) = b(ni) - A(ni,k)*b(nk);
    end
end
```

```
    ns = l(s);
    x(s) = b(ns)/A(ns,s);

    for i = s-1:-1:1
        ni = l(i);
        sum = b(ni);
        for j = i+1:s
            sum = sum - A(ni,j)*x(j);
        end
        x(i) = sum/A(ni,i);
    end
end
```

main.m code:

```
function main()
    fprintf('n\t\tAb\t\t\tno piv\t\t\tno piv\t\tcond(A)\n');
    fprintf('------------------------------------------------------------\n');
    for s =  2:20
        H = hilb(s);
        b = sum(H,2);
        x = ones(s,1);

        A = gauss(H);
        l = 1:1:s;
        [Ap lp] = gauss_p(H);

        xn = backward(A,b,l)';
        xp = backward(Ap,b,lp)';
```

```
        Ab = norm(H\b - x)/norm(x);
        err = norm(xn - x)/norm(x);
        errp = norm(xp - x)/norm(x);
        con = cond(H);

        fprintf('%d\t%e\t%e\t%e\t%e\n', s,Ab,err,errp,con);



    end
end
```

main2.m code:

```
function main2()
    fprintf('n\t\tAb\t\t\t\tno piv\t\t\t\tpiv\t\t\tcond(A)\n');
    fprintf('-----------------------------------------------------------------\n');
    for s =  1:5
        A = rand(500);
        b = sum(A,2);
        x = ones(500,1);

        A = gauss(A);
        l = 1:1:500;
        [Ap lp] = gauss_p(A);

        xn = backward(A,b,l)';
        xp = backward(Ap,b,lp)';

        Ab = norm(A\b - x)/norm(x);
```

```
        err = norm(xn - x)/norm(x);
        errp = norm(xp - x)/norm(x);
        con = cond(A);

        fprintf('%d\t%e\t%e\t%e\t%e\n', 500,Ab,err,errp,con);


    end
end
```