Jake Traut

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Numerical Computation Problem Set 4

function solution = gaussian(A,b)

%A is 3x3 matrix, b is the vector

%Solves the linear system Ax = b

[m,n] = size(A);

[c,r] = size(b);

if [m,n] ~= [3,3]

solution = ('Matrix dimension must be 3x3');

return

elseif [c,r] ~= [3,1]

solution = ('Vector must have length 3');

return

end

x = zeros(3,1);

%forward elimination

for j = 1:n-1

A

b

for i = j+1:n

multiplier = A(i,j)/A(j,j);

b(i) = b(i) - multiplier\*b(j);

for k = j:n

A(i,k) = A(i,k) - multiplier\*A(j,k);

end

end

end

A

b

%back substitution

%check for zeros in diagonal

if (A(1,1) == 0 || A(2,2) == 0 || A(3,3) == 0)

solution = ('Zero in diagonal, cannot divide by zero, no solution');

return

end

x(3) = b(3)/A(3,3);

x(2) = (b(2) - A(2,3)\*x(3))/A(2,2);

x(1) = (b(1) - A(1,2)\*x(2) - A(1,3)\*x(3))/A(1,1);

solution = x;

1. Guassian elimination on MATLAB

EDU>> set\_solutions

A =

-11 3 3

-2 -5 1

1 -10 8

b =

18

-3

5

A =

-11.0000 3.0000 3.0000

0 -5.5455 0.4545

0 -9.7273 8.2727

b =

18.0000

-6.2727

6.6364

A =

-11.0000 3.0000 3.0000

0 -5.5455 0.4545

0 0 7.4754

b =

18.0000

-6.2727

17.6393

solutionA =

-0.6316

1.3246

2.3596



EDU>> set\_solutions

A =

0.1600 0.8500 0.3400

-0.2500 -1.5000 0.5000

1.0300 5.4600 1.7700

b =

0.2700

-0.2100

1.7500

A =

0.1600 0.8500 0.3400

0 -0.1719 1.0313

0 -0.0119 -0.4188

b =

0.2700

0.2119

0.0119

A =

0.1600 0.8500 0.3400

0 -0.1719 1.0313

0 0 -0.4900

b =

0.2700

0.2119

-0.0028

solutionB =

8.0446

-1.1989

0.0056



EDU>> set\_solutions

A =

-2 1 -4

7 -3 1

3 -1 -7

b =

3

-1

-7

A =

-2.0000 1.0000 -4.0000

0 0.5000 -13.0000

0 0.5000 -13.0000

b =

3.0000

9.5000

-2.5000

A =

-2.0000 1.0000 -4.0000

0 0.5000 -13.0000

0 0 0

b =

3.0000

9.5000

-12.0000

solutionC =

Zero in diagonal, cannot divide by zero, no solution