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**Exercises**

Section 7.1: 1, 5, 6

1. Show that the system of equations

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possesses a unique solution when α = 0, no solution when α = −1, and infinitely many solutions when α = 1. Also, investigate the corresponding situation when the right-hand side is replaced by 0’s.

Answer:

5. Consider

A screenshot of a computer

Description automatically generated with low confidence

Compute residual vectors ~r = A~x − b and ~r = A~x − b and decide which of ~x and ~x is the better solution vector. Now compute the error vectors e = ~x − x and ~e = ~x − x, where x = [1, −1]T is the exact solution. Discuss the implications of this example.

Answer:

6. Consider the system

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Description automatically generated

where b1 ≠ 0 and b2 ≠ 0. Its exact solution is

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a. Let b1 = 1 and b2 = 2. Solve this system using naive Gaussian elimination with three-digit (rounded) arithmetic and compare with the exact solution x1 = 1.00010 ... and x2 = 0.99989 9....

b. Repeat the preceding part after interchanging the order of the two equations.

c. Find values of b1 and b2 in the original system so that naive Gaussian elimination does not give poor answers.

Answer:

**Section 7.2: 2, 7, 13(a)**

2. Solve the following system using Gaussian elimination with scaled partial pivoting:

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Show intermediate matrices at each step

Answer:

7. If the Gaussian elimination algorithm with scaled partial pivoting is used on the example shown, which row will be selected as the third pivot row?

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Answer:

13. Solve each of the following systems using Gaussian elimination with scaled partial pivoting. Carry four significant figures. What are the contents of the index array at each step?

Chart, box and whisker chart

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Answer:

**Section 7.3: 1, 4, 5**

1. What happens to the tridiagonal System (1) if Gaussian elimination with partial pivoting is used to solve it? In general, what happens to a banded system?

Answer:

4. Give an example of a system of linear equations in tridiagonal form that cannot be solved without pivoting.

Answer:

5. What is the appearance of a matrix A if its elements satisfy ai j = 0 when:

a. j < i − 2

b. j > i + 1

Answer:

**Computing Exercises**

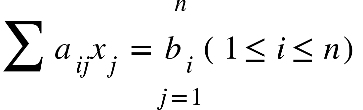
**Section 7.1: 3, 8**

3. Define an n × n matrix A by the equation ai j = i + j. Define b by the equation bi = i + 1. Solve **Ax = b** by using procedure Naive Gauss. What should x be?

Answer:

<https://www.chegg.com/homework-help/questions-and-answers/matlab-following-question-needs-programmed-using-matlab-need-able-see-code-output-resulted-q20221461?trackid=b8c8e9d11bbc&strackid=5d57d0b9967e>

8. Select a reasonable value of n, and generate a random n × n array a using a random number generator. Define the array b such that the solution of the system



is xj= j, where 1≤j≤n Test the naive Gaussian algorithm on this system. Hint: You may use the function Random, which is discussed in Chapter 13, to generate the random elements of the (ai j) array.

Answer:

<https://www.chegg.com/homework-help/questions-and-answers/matlab-please-original-code-copied-another-post-please-thanks-8-select-reasonable-value-n--q88104243?trackid=72226e4b6309&strackid=49eeba5c0876>

**Section 7.2: 2, 3**

2. Consider the system

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Solve it by Gaussian elimination with scaled partial pivoting using procedures Gauss and Solve.

Answer:

<https://www.chegg.com/homework-help/numerical-mathematics-and-computing-7th-edition-chapter-2.2-problem-2ce-solution-9781133103714?trackid=17074a66ab6d&strackid=002b2a1b8252>

3. (Continuation) Assume that an error was made when the coefficient matrix in Computer Problem 7.2.2 was typed and that a single digit was mistyped—namely, 0.3645 became 0.3345. Solve this system, and notice the effect of this small change. Explain.

Answer:

<https://www.chegg.com/homework-help/questions-and-answers/consider-augmented-matrix-04096-01234-03678-02943-l-04043-02246-03872-04015-01129-01550-03-q20501323>

**Section 7.3: 1, 4, 6**

1. Rewrite procedure Tri using only four arrays, (ai), (di), (ci), and (bi), and storing the solution in the (bi) array. Test the code with both a nonsymmetric and a symmetric tridiagonal system.

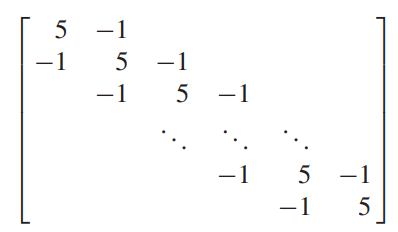
Answer:

4. Use procedure Tri to solve the following system of 100 equations. Compare the numerical solution to the obvious exact solution.

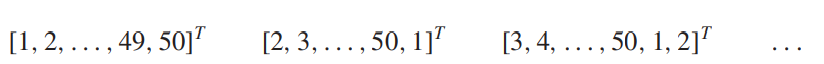
Answer:

<https://www.chegg.com/homework-help/use-procedure-tri-solve-following-system-100-equations-compa-chapter-7.3-problem-4cp-solution-9780495114758-exc?trackid=27d686683fe2&strackid=833ae46f83fd>

6. Let A be the 50 × 50 tridiagonal matrix



Consider the problem Ax = b for 50 different vectors b of the form



Consider the problem Ax = b for 50 different vectors b of the form.

Answer:

<https://www.chegg.com/homework-help/questions-and-answers/please-provide-matlab-code-solve-problem-procedure-tri-tridiagonal-system-use-n-x-1-single-q61118133?trackid=3d98415390c9&strackid=06a7d665980b>