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From 'Numerical Analysis : An
Algorithmic Approach Third Edition'
(c) 1980 by S. D. Conte and Carl de Boor
'Chapter 4 Matrices and the Solution of'
'Linear Equations'

Exercise 4.1-1
Matrix Manipulation

 1       7       4
 4       1       3
 2       2       4

 4       3       5
-1      -4       0
 4      10       6

Matrix AB is unequal matrix BA

 1       4       2
 7       1       2
 4       3       4

 1       4       2
 7       1       2
 4       3       4

Matrix AB transpose is equal matrix BT AT

Example 4.3
Solution of a Tridiagonal Linear System

 n      x[i]           Exact          Error
 1      0.90909091     0.90909091     1.110223e-16
 2      0.81818182     0.81818182     2.220446e-16
 3      0.72727273     0.72727273     1.110223e-16
 4      0.63636364     0.63636364     0.000000e+00
 5      0.54545455     0.54545455     1.110223e-16
 6      0.45454545     0.45454545     5.551115e-17
 7      0.36363636     0.36363636     0.000000e+00
 8      0.27272727     0.27272727     0.000000e+00
 9      0.18181818     0.18181818     2.775558e-17
10      0.09090909     0.09090909     2.775558e-17

Exercise 4.2-8
Solution of a Linear System Using Elimination

0.21    0.32    0.12    0.31    0.96
0.10    0.15    0.24    0.22    0.71
0.20    0.24    0.46    0.36    1.26
0.61    0.40    0.32    0.20    1.53

  0.21    0.32    0.12    0.31    0.96
  0.48   -0.00    0.18    0.07    0.25
  0.95   27.20   -4.63   -1.90   -6.53
  2.90  222.40    8.79   -0.06   -0.06

n       x[i]    Exact   Error
1       1.00    1.00    1.809664e-14
2       1.00    1.00    1.154632e-14
3       1.00    1.00    0.000000e+00
4       1.00    1.00    0.000000e+00

Example 4.3
Solution of a Tridiagonal Linear System

 n      x[i]
 1      -0.00000000
 2      +0.00471077
 3      +0.00951575
 4      +0.01451105
```

```
 5      +0.01979658
 6      +0.02547803
 7      +0.03166904
 8      +0.03849344
 9      +0.04608770
10      +0.05460372
11      +0.06421181
12      +0.07510414
13      +0.08749855
14      +0.10164293
15      +0.11782017
16      +0.13635381
17      +0.15761453
18      +0.18202754
19      +0.21008110
20      +0.24233628
21      +0.27943819
22      +0.32212886
23      +0.37126211
24      +0.42782060
25      +0.49293550
26      +0.56790912
27      +0.65424091
28      +0.75365753
29      +0.86814729
30      +1.00000000

Sample Matrix for Inversion

+2      +3      -1
+4      +4      -3
-2      +3      -1

Sample Matrix Inverse

+0.25000000    +0.00000000    -0.25000000
+0.50000000    -0.20000000    +0.10000000
+1.00000000    -0.60000000    -0.20000000

Sample Matrix for Inverse Iteration

+1      +2      +0
+2      +1      +0
+0      +0      -1

iter    Eigenvalue     Eigenvector
   1    +2.99180073e+00        -3.49909254e+01        -3.49909254e+01        -1.43744621e-01
   2    +2.99999986e+00        +4.28547756e+01        +4.28547756e+01        +7.23221905e-04
   3    +3.00000000e+00        -4.28549564e+01        -4.28549564e+01        -2.97104737e-06
   4    +3.00000000e+00        +4.28549564e+01        +4.28549564e+01        +1.22052239e-08

Sample Matrix for Inverse Iteration

+1      +2      +0
+2      +1      +0
+0      +0      -1

iter    Eigenvalue     Eigenvector
   1    -9.00000000e+00        +1.92450090e-01        +1.92450090e-01        -5.77350269e-01
   2    -1.32000000e+00        +1.00503782e-01        +1.00503782e-01        +9.04534034e-01
   3    -1.03319502e+00        +3.65880867e-02        +3.65880867e-02        -9.87878340e-01
   4    -1.00366133e+00        +1.23287787e-02        +1.23287787e-02        +9.98631074e-01
   5    -1.00040648e+00        +4.11459926e-03        +4.11459926e-03        -9.99847619e-01
   6    -1.00004516e+00        +1.37171888e-03        +1.37171888e-03        +9.99983065e-01
   7    -1.00000502e+00        +4.57246510e-04        +4.57246510e-04        -9.99998118e-01
   8    -1.00000056e+00        +1.52415758e-04        +1.52415758e-04        +9.99999791e-01
   9    -1.00000006e+00        +5.08052622e-05        +5.08052622e-05        -9.99999977e-01

Sample Matrix for Upper Hessenberg

+4.0    -1.0    -1.0    -1.0
```

```
-1.0    +4.0    -1.0    -1.0
-1.0    -1.0    +4.0    -1.0
-1.0    -1.0    -1.0    +4.0
```

Upper Hessenberg Matrix

```
+4.0    -1.0    -1.0    -1.0
-1.0    +4.0    -1.0    -1.0
+0.0    -1.0    +4.0    -1.0
+0.0    +0.0    -1.0    +4.0
```

Sample Matrix for Upper Hessenberg

```
+0.0    +1.0    +1.0    +1.0    +1.0    +1.0
+1.0    +0.0    +0.0    +0.0    +0.0    -1.0
-1.0    +1.0    +0.0    +0.0    +0.0    -1.0
-1.0    +0.0    +1.0    +0.0    +0.0    -1.0
-1.0    +0.0    +0.0    +1.0    +0.0    -1.0
+0.0    +0.0    +0.0    -0.5    +0.5    +0.0
```

Upper Hessenberg Matrix

```
+0.0    -2.0    -1.0    +0.0    +0.0    +1.0
+1.0    +0.0    +0.0    +0.0    +1.0    -1.0
+0.0    +1.0    +0.0    +0.0    +2.0    -2.0
+0.0    +0.0    +1.0    +0.0    +4.0    -4.0
+0.0    +0.0    +0.0    +1.0    +8.0    -8.0
+0.0    +0.0    +0.0    +0.0    +8.5    -8.0
```