Chap 2

14, 17, 19, 27, 31, 51, 55, 56, 66, 68, 73, 78, 79

---

14. a. See Exercise 12. The solution is [1,1,1].
    b. The reduced matrix is

8	-6	-8	-6
0	4.25	7	11.2
0	0	-0.06	-0.04

which has the solution [1.08,1.54,0.667].

c. With the changed coefficient, the solution becomes [3.209876,0.2345679,0.7160494].

上面(a)小題提到的Exercise 12的題目與答案

12. The first procedure described in Section 2.2 is sometimes called "Naive Gaussian Elimination." Use it to solve Exercises 13 and 14.

12. For Exercise 13, the reduced matrix is

3	1	-4	7
0	11	-5	-1
0	0	243	174

which has the solution [260/81,19/81,58/81].

For Exercise 14, the reduced matrix is

3	2	4	9
0	-34	-56	-90
0	0	-6	-6

which has the solution [1,1,1].

---

17. a. Two interchanges are needed; the final arrangement is row 2, row 3, row 1.
    b. Solution: [-0.111,0.0769,1.56].
    c. Solution: [-0.110,0.0846,1.57].

---

19. After interchanging row 1 and row 2, we get

1	0	0	-0.1132
0	1	0	0.0755
0	0	1	1.5660

---

27. The exact solution to this problem is
[-0.0673077,1.30667,6.49754].
If we scale the matrix, using many digits of precision, we get:

1	-0.532680	0.231124	0.731235
1	0.724756	-0.236156	-0.654723
0.553763	1	0.236559	2.80645

a. Using 6 digits on this scaled system, the solution is
[-0.06731,1.30667,6.49764].
b. Using 3 digits on this scaled system, the solution is
[-0.06, 1.30,6.49].
In this problem, scaling has little effect.

31* The LU equivalent of the coefficient matrix is

8	-3	2
-0.125	9.625	2.250
0.125	-0.1688	4.1299

where the U matrix has ones on its diagonal. Rows were interchanged. Using this to solve with the given right-hand sides gives:

a. [-0.3711,0.3585,0.5220].
b. [1.1635,0.1132,-0.9843].

---

51. a. The rows of the matrix are linearly dependent: R1 = -R4.
b. Determinant = 19.7; smaller because it is more nearly singular.

---

55. With 7 digits (rounded to 3):

9.32	0.0254	-0.0964	9.24
4.61	0.173	-0.0558	4.82
7.64	0.0812	0.0914	7.56
10.0	0.000	0.000	10.0

With 3 digits:

8.76	0.0238	-0.0905	8.67
4.32	0.190	-0.534	4.52
7.19	0.0762	0.0952	7.10
9.38	0.000	0.000	9.38

They differ because the matrix is nearly singular.

---

56. They are identical. Because the elements of A are integers and the matrix is well conditioned, we can get the inverse as rational numbers, not just as floating-point values.

---

66. a. With 10 digits of precision, the solution is [-631.91,-493.62,1592.60].
    b. With 4 digits, we get [2931,2289,1592.60].
    c. With 3 digits, we get [292,230,-738].
    d. Vector e is [-3562.9,-2782.6,8977.6]. Norms are: norm-1 = 15323, norm-2 = 10052, norm-∞ = 8977.6, Frobenius norm = 10052.
    e. Yes, condition numbers are: norm-1: 55228; norm-2: 30697; norm-∞: 56751; Frobenius norm: 37158

---

68. With 10 digits, solution is [64.9483,50.7583,-162.797], with 4 digits [70.13,54.78,-175.8]. If only 3 digits, a very different answer.

---

73. Using MATLAB (which has a precision of many digits), we get:
r = $[-27021.766,-11399.092,-8852.0462]^T$.
e-bar = $[3562.911376,-2782.617725,-0.000375158362]^T$
x-corr = $[-631.911376,-493.6177248,1592.599625]^T$,
which is correct to 10 digits. If only a few digits of precision were use to solve for e-bar, it might take repeated iterations.

78* We switch rows 2 and 3 to make diagonally dominant. Then Jacobi takes iterations to get the solution from [0,0,0]:
[-0.14332,-1.37459,0.71987].

79* The same answer as in Exercise 78 is obtained in 13 iterations.
