#exercise5.3

#15.11.11

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from exercise2 import \*

import numpy as np

def \_q3():

A = np.matrix([[10,7, 8, 7],

[7, 5, 6, 5],

[8, 6, 10, 9],

[7, 5, 9, 10]])

detA = np.linalg.det(A)

print("detA:", detA)

eig\_val, eig\_array = np.linalg.eig(A)

print("eig\_val:", eig\_val)

cond2A = np.linalg.cond(A, p = 2)

print("cond2A:", cond2A)

b = np.matrix([[32], [23], [33], [31]])

x = np.linalg.solve(A, b)

A\_plus\_delta\_A = np.matrix([[10, 7, 8.1, 7.2],

[7.08, 5.04, 6, 5],

[8, 5.98, 9.89, 9],

[6.99, 5, 9, 9.98]])

delta\_x = np.linalg.solve(A\_plus\_delta\_A, b) - x

print("delta\_x:", delta\_x)

norm2\_delta\_x = np.linalg.norm(delta\_x, 2)

print("norm2\_delta\_x:", norm2\_delta\_x)

relative\_error\_x = norm2\_delta\_x / np.linalg.norm(x,2)

print("relative\_error\_x:", relative\_error\_x)

delta\_A = A\_plus\_delta\_A - A

relative\_error\_A = np.linalg.norm(delta\_A, 2) / np.linalg.norm(A, 2)

print("relative\_error\_A:", relative\_error\_A)

def main():

\_q3()

if \_\_name\_\_ == '\_\_main\_\_':

main()

运算结果如下：

detA: 1.0

eig\_val: [ 3.02886853e+01 3.85805746e+00 1.01500484e-02 8.43107150e-01]

cond2A: 2984.09270168

delta\_x: [[-10.58625819]

[ 17.37408768]

[ -4.22579146]

[ 2.52401097]]

norm2\_delta\_x: 20.9321697376

relative\_error\_x: 10.4660848688

relative\_error\_A: 0.00762028751845

[Finished in 1.0s]

对运算结果的分析：

由于这个方程的系数矩阵A的条件数cond2A为2984，我们可以认为这个方程是病态的，

所以当relative\_error\_A，即A的扰动很小的时候，x的解变化很大。