```
# problem 8

theta1 = 45 / 180 * pi

theta1 =

    0.7854

theta2 = -60 / 180 * pi

theta2 =

   -1.0472

theta3 = 90 / 180 * pi

theta3 =

    1.5708

theta4 = 30 / 180 * pi

theta4 =

    0.5236

## problem 8 first calculation method
checkpoint1 = [cos(theta1) -sin(theta1); sin(theta1) cos(theta1)]

checkpoint1 =

    0.7071   -0.7071
    0.7071    0.7071

checkpoint2 = [cos(theta1+theta2) -sin(theta1+theta2);
sin(theta1+theta2) cos(theta1+theta2)]

checkpoint2 =

    0.9659    0.2588
   -0.2588    0.9659

checkpoint3 = [cos(theta1+theta2+theta3) -sin(theta1+theta2+theta3);
sin(theta1+theta2+theta3) cos(theta1+theta2+theta3)]

checkpoint3 =

    0.2588   -0.9659
    0.9659    0.2588
```

```
checkpoint4 = [cos(theta1+theta2+theta3+theta4) −
sin(theta1+theta2+theta3+theta4); sin(theta1+theta2+theta3+theta4)
cos(theta1+theta2+theta3+theta4)]

checkpoint4 =

   −0.2588   −0.9659
    0.9659   −0.2588

rotate1 = [cos(theta1) −sin(theta1); sin(theta1) cos(theta1)]

rotate1 =

    0.7071   −0.7071
    0.7071    0.7071

rotate2 = [cos(theta2) −sin(theta2); sin(theta2) cos(theta2)]

rotate2 =

    0.5000    0.8660
   −0.8660    0.5000

rotate3 = [cos(theta3) −sin(theta3); sin(theta3) cos(theta3)]

rotate3 =

    0.0000   −1.0000
    1.0000    0.0000

rotate4 = [cos(theta4) −sin(theta4); sin(theta4) cos(theta4)]

rotate4 =

    0.8660   −0.5000
    0.5000    0.8660

## problem 8 second calculation method

final_rotate_1 = rotate1

final_rotate_1 =

    0.7071   −0.7071
    0.7071    0.7071

final_rotate_2 = rotate2 * final_rotate_1

final_rotate_2 =
```

```
   0.9659    0.2588
  -0.2588    0.9659

final_rotate_3 = rotate3 * final_rotate_2

final_rotate_3 =

   0.2588   -0.9659
   0.9659    0.2588

final_rotate_4 = rotate4 * final_rotate_3

final_rotate_4 =

  -0.2588   -0.9659
   0.9659   -0.2588


# problem 9

A = rand(5)

A =

   0.3786    0.8759    0.3012    0.2259    0.9234
   0.8116    0.5502    0.4709    0.1707    0.4302
   0.5328    0.6225    0.2305    0.2277    0.1848
   0.3507    0.5870    0.8443    0.4357    0.9049
   0.9390    0.2077    0.1948    0.3111    0.9797

B = rand(5)

B =

   0.4389    0.2622    0.2967    0.2625    0.4886
   0.1111    0.6028    0.3188    0.8010    0.5785
   0.2581    0.7112    0.4242    0.0292    0.2373
   0.4087    0.2217    0.5079    0.9289    0.4588
   0.5949    0.1174    0.0855    0.7303    0.9631

AB = A * B

AB =

   0.9829    1.0001    0.7130    1.6940    1.7562
   0.8645    0.9678    0.7394    1.1402    1.3192
   0.5655    0.7511    0.5857    0.9916    0.9576
   1.1534    1.2492    0.9480    1.6525    1.7827
   1.1954    0.6940    0.6692    1.4231    1.7115
```

```
BA = B * A

BA =

    1.0879    0.9689    0.6408    0.4778    1.2891
    1.5254    1.2178    1.1798    0.7296    1.7125
    1.1340    0.9478    0.5813    0.3628    0.8816
    1.3619    1.4367    1.2182    0.7933    1.8567
    1.5266    1.2677    1.0584    0.7917    2.2201

transpose(AB)

ans =

    0.9829    0.8645    0.5655    1.1534    1.1954
    1.0001    0.9678    0.7511    1.2492    0.6940
    0.7130    0.7394    0.5857    0.9480    0.6692
    1.6940    1.1402    0.9916    1.6525    1.4231
    1.7562    1.3192    0.9576    1.7827    1.7115

transpose(A) * transpose(B)

ans =

    1.0879    1.5254    1.1340    1.3619    1.5266
    0.9689    1.2178    0.9478    1.4367    1.2677
    0.6408    1.1798    0.5813    1.2182    1.0584
    0.4778    0.7296    0.3628    0.7933    0.7917
    1.2891    1.7125    0.8816    1.8567    2.2201

inv(AB)

ans =

   -4.8104  -13.3880   -7.9071   19.0917   -0.2066
    0.6978   -2.9759   -9.0839   10.2264   -3.9916
   -2.3159    9.0189   15.3380  -16.7213    4.2599
   -1.3359  -11.3075    1.2153    9.1920   -0.1679
    5.0933   16.4331    2.1986  -18.5864    0.8211

inv(A) * inv(B)

ans =

    6.9658    3.9662   -2.8100   -3.5186   -3.0456
   -6.2327   -5.2278    5.2324    3.6661    2.5079
  -40.9090   -9.8010   20.9811    6.7794   17.3132
  117.2816   37.3293  -66.4922  -17.8332  -55.5773
  -23.5531   -8.3820   12.6545    3.4538   12.6789
```

(AB) * (AB)

ans =

    6.2873   5.8214   4.6391   8.8111   9.7541
    4.9968   4.6964   3.7288   7.0629   7.7936
    3.8249   3.6357   2.8825   5.3966   5.9516
    6.7870   6.3760   5.0609   9.5862   10.5786
    5.8409   5.3353   4.2519   8.2674   9.1221

(A*A)*(B*B)

ans =

    5.8468   4.7852   4.5563   9.0154   8.7381
    5.2166   4.3127   4.1176   8.1952   7.8356
    3.8858   3.2789   3.0939   6.1324   5.8646
    6.5195   5.4120   5.1387   10.1325   9.7644
    6.1410   4.8625   4.7318   9.4815   9.1342

answer for problem 9.e
Different calculations give different results. The order of matrix
calculations matters.

problem 10

T = [0.4 0.7 0.4 0.2;
0.5 0.2 0.2 0.2;
0.1 0.1 0.2 0.3;
0 0 0.2 0.3]

T =

    0.4000   0.7000   0.4000   0.2000
    0.5000   0.2000   0.2000   0.2000
    0.1000   0.1000   0.2000   0.3000
         0   0   0.2000   0.3000

c = [1000; 500; 800; 2000]

c =

        1000
         500
         800
        2000

after 1 year

```
T * c

ans =

        1470
        1160
         910
         760

# after 2 years

(T^2) * c

ans =

   1.0e+03 *

    1.9160
    1.3010
    0.6730
    0.4100

# after 10 years

(T^10) * c

ans =

   1.0e+03 *

    2.1413
    1.5023
    0.5103
    0.1460
```