

Домашнее задание №1 по Математическим основам теории систем

Вариант №5

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Матрицы A_1 , A_2 , A_3 :

$$A_1 = \begin{bmatrix} -5 & 0 \\ 0 & -9 \end{bmatrix}$$

$$A_1 = \begin{matrix} 2 \times 2 \\ \begin{matrix} -5 & 0 \\ 0 & -9 \end{matrix} \end{matrix}$$

$$A_2 = \begin{bmatrix} -6 & -3 \\ -1 & -8 \end{bmatrix}$$

$$A_2 = \begin{matrix} 2 \times 2 \\ \begin{matrix} -6 & -3 \\ -1 & -8 \end{matrix} \end{matrix}$$

$$A_3 = \begin{bmatrix} -8 & -3 \\ -10 & -8 \end{bmatrix}$$

$$A_3 = \begin{matrix} 2 \times 2 \\ \begin{matrix} -8 & -3 \\ -10 & -8 \end{matrix} \end{matrix}$$

Задание № 1

Вычислить матричные инварианты (собственные значения, определитель и след матрицы)

Решение

Находим определитель матриц:

$$\det_1 = \det(A_1)$$

$$\det_1 = 45$$

$$\det_2 = \det(A_2)$$

$$\det_2 = 45$$

$$\det_3 = \det(A_3)$$

$$\det_3 = 34$$

Далее определяем собственные значения матрицы:

```
l_1 = eig(A_1)%возвращает вектор-столбец, содержащий собственные значения матрицы A_1
```

```
l_1 = 2x1
    -9
    -5
```

```
l_2 = eig(A_2)
```

```
l_2 = 2x1
    -5
    -9
```

```
l_3 = eig(A_3)
```

```
l_3 = 2x1
   -2.5228
  -13.4772
```

Вычисляем след матрицы:

```
trace_1 = trace(A_1)
```

```
trace_1 = -14
```

```
trace_2 = trace(A_2)
```

```
trace_2 = -14
```

```
trace_3 = trace(A_3)
```

```
trace_3 = -16
```

Задание №2

Вычислить матричные инварианты (собственные векторы, нормы матриц, сингулярные числа и числа обусловленности)

Решение:

Сначала находим собственные вектора:

```
[V_1,D_1] = eig(A_1)%V-матрица собственных векторов
```

```
V_1 = 2x2
     0     1
     1     0
D_1 = 2x2
    -9     0
     0    -5
```

```
[V_2,D_2] = eig(A_2)
```

```
V_2 = 2x2
     0.9487     0.7071
    -0.3162     0.7071
D_2 = 2x2
    -5     0
```

0 -9

```
[V_3,D_3] = eig(A_3)
```

```
V_3 = 2x2
    0.4804    0.4804
   -0.8771    0.8771
D_3 = 2x2
   -2.5228     0
     0   -13.4772
```

Далее вычисляем нормы матрицы:

Евклидова норма:

```
n_1 = norm(A_1, 'fro')
```

```
n_1 = 10.2956
```

```
n_2 = norm(A_2, 'fro')
```

```
n_2 = 10.4881
```

```
n_3 = norm(A_2, 'fro')
```

```
n_3 = 10.4881
```

Операторные нормы:

Столбцовые нормы:

```
s_1 = norm(A_1, 1)
```

```
s_1 = 9
```

```
s_2 = norm(A_2, 1)
```

```
s_2 = 11
```

```
s_3 = norm(A_3, 1)
```

```
s_3 = 18
```

Строчные нормы:

```
str_1 = norm(A_1, "inf")
```

```
str_1 = 9
```

```
str_2 = norm(A_2, "inf")
```

```
str_2 = 9
```

```
str_3 = norm(A_3, "inf")
```

```
str_3 = 18
```

Спектральная норма:

```
sp = norm(A_1)
```

```
sp = 9
```

```
sp_2 = norm(A_2)
```

```
sp_2 = 9.3071
```

```
sp_3 = norm(A_3)
```

```
sp_3 = 15.2321
```

Вычислим сингулярные числа:

```
svd_1 = svd(A_1) %функция svd(A_1) возвращает сингулярные значения матрицы A_1 в порядке убывания
```

```
svd_1 = 2×1  
9  
5
```

```
svd_2 = svd(A_2)
```

```
svd_2 = 2×1  
9.3071  
4.8350
```

```
svd_3 = svd(A_3)
```

```
svd_3 = 2×1  
15.2321  
2.2321
```

Далее найдем числа обусловленности:

```
c_1 = cond(A_1) %функция cond(A_1) возвращает число обусловленности 2-нормы для инверсии, равно
```

```
c_1 = 1.8000
```

```
c_2 = cond(A_2)
```

```
c_2 = 1.9250
```

```
c_3 = cond(A_3)
```

```
c_3 = 6.8240
```

Задание №3

Определить, какие матрицы подобны.

Решение:

Так как след и определитель матрицы A_1 и A_2 одинаковы, следовательно, эти матрицы могут быть подобны. Так как это необходимое (но недостаточное) условие подобия матриц. Необходимо в этом убедиться: для этого определим Жорданову форму.

```
J_1 = jordan(A_1)
```

```
J_1 = 2×2
```

$$\begin{pmatrix} -5 & 0 \\ 0 & -9 \end{pmatrix}$$

```
J_2 = jordan(A_2)
```

$$J_2 = 2 \times 2 \begin{pmatrix} -9 & 0 \\ 0 & -5 \end{pmatrix}$$

```
J_3 = jordan(A_3)
```

$$J_3 = 2 \times 2 \begin{pmatrix} -13.4772 & 0 \\ 0 & -2.5228 \end{pmatrix}$$

Две жордановы матрицы подобны тогда и только тогда, когда они составлены из одинаковых жордановых клеток и отличаются друг от друга лишь расположением клеток на главной диагонали. Следовательно, матрица J_1 подобна J_2 , а это значит матрицы A_1 и A_2 тоже подобны.

Задание №4

Определить алгебраическую и геометрическую кратности собственных значений

Решение:

Для определения алгебраической кратности, достаточно посмотреть на собственные числа матрицы A_1 , A_2 , A_3 . Так как нет повторяющихся собственных чисел, значит, алгебраическая кратность всех собственных значений равна 1.

Так как алгебраическая кратность равна 1, геометрическая кратность тоже равна 1.

Задание №5

Построить отображения единичной сферы в эллипсоиды = для подобных матриц. При выполнении задания единичную сферу задать :

```
syms a % 0 ≤ a ≤ 360°
X = [cos(a); sin(a)]
```

$$X = \begin{pmatrix} \cos(a) \\ \sin(a) \end{pmatrix}$$

Все вычисления выполнить с помощью программы, написанной в программе Matlab.

Решение:

Построение отображения единичной сферы в эллипсоиды $y = A_1 \cdot X$

```
x = 0:pi/50:2*pi;
y = A_1*[cos(x); sin(x)]
```

$$y = 2 \times 101 \begin{pmatrix} -5.0000 & -4.9901 & -4.9606 & -4.9114 & -4.8429 & -4.7553 & -4.6489 & -4.5241 & \dots \\ 0 & -0.5651 & -1.1280 & -1.6864 & -2.2382 & -2.7812 & -3.3131 & -3.8320 \end{pmatrix}$$

```
x_ = y(1,:)
```

```
x_ = 1×101
-5.0000 -4.9901 -4.9606 -4.9114 -4.8429 -4.7553 -4.6489 -4.5241 ...
```

```
y_ = y(2,:)
```

```
y_ = 1×101
0 -0.5651 -1.1280 -1.6864 -2.2382 -2.7812 -3.3131 -3.8320 ...
```

```
h = plot(x_,y_)
```

```
h =
Line with properties:
```

```
Color: [0 0.4470 0.7410]
LineStyle: '-'
LineWidth: 0.5000
Marker: 'none'
MarkerSize: 6
MarkerFaceColor: 'none'
XData: [-5 -4.9901 -4.9606 -4.9114 -4.8429 -4.7553 -4.6489 -4.5241 -4.3815 -4.2216 -4.0451 -3.8526 -3.6451 -3.4224 -3.1847 -2.9320 -2.6651 -2.3841 -2.0889 -1.7804 -1.4586 -1.1235 -0.7751 -0.4134 0.1599 0.7330 1.3061 1.8792 2.4523 3.0254 3.5985 4.1716 4.7447 5.3178 5.8909 6.4640 7.0371 7.6102 8.1833 8.7564 9.3295 9.9026 10.4757 11.0488 11.6219 12.1950 12.7681 13.3412 13.9143 14.4874 15.0605 15.6336 16.2067 16.7798 17.3529 17.9260 18.4991 19.0722 19.6453 20.2184 20.7915 21.3646 21.9377 22.5108 23.0839 23.6570 24.2301 24.8032 25.3763 25.9494 26.5225 27.0956 27.6687 28.2418 28.8149 29.3880 29.9611 30.5342 31.1073 31.6804 32.2535 32.8266 33.3997 33.9728 34.5459 35.1190 35.6921 36.2652 36.8383 37.4114 37.9845 38.5576 39.1307 39.7038 40.2769 40.8500 41.4231 41.9962 42.5693 43.1424 43.7155 44.2886 44.8617 45.4348 46.0079 46.5810 47.1541 47.7272 48.3003 48.8734 49.4465 50.0196 50.5927 51.1658 51.7389 52.3120 52.8851 53.4582 54.0313 54.6044 55.1775 55.7506 56.3237 56.8968 57.4699 58.0430 58.6161 59.1892 59.7623 60.3354 60.9085 61.4816 62.0547 62.6278 63.2009 63.7740 64.3471 64.9202 65.4933 66.0664 66.6395 67.2126 67.7857 68.3588 68.9319 69.5050 70.0781 70.6512 71.2243 71.7974 72.3705 72.9436 73.5167 74.0898 74.6629 75.2360 75.8091 76.3822 76.9553 77.5284 78.1015 78.6746 79.2477 79.8208 80.3939 80.9670 81.5401 82.1132 82.6863 83.2594 83.8325 84.4056 84.9787 85.5518 86.1249 86.6980 87.2711 87.8442 88.4173 88.9904 89.5635 90.1366 90.7097 91.2828 91.8559 92.4290 93.0021 93.5752 94.1483 94.7214 95.2945 95.8676 96.4407 97.0138 97.5869 98.1600 98.7331 99.3062 99.8793 100.4524 101.0255 101.5986 102.1717 102.7448 103.3179 103.8910 104.4641 105.0372 105.6103 106.1834 106.7565 107.3296 107.9027 108.4758 109.0489 109.6220 110.1951 110.7682 111.3413 111.9144 112.4875 113.0606 113.6337 114.2068 114.7799 115.3530 115.9261 116.4992 117.0723 117.6454 118.2185 118.7916 119.3647 119.9378 120.5109 121.0840 121.6571 122.2302 122.8033 123.3764 123.9495 124.5226 125.0957 125.6688 126.2419 126.8150 127.3881 127.9612 128.5343 129.1074 129.6805 130.2536 130.8267 131.3998 131.9729 132.5460 133.1191 133.6922 134.2653 134.8384 135.4115 135.9846 136.5577 137.1308 137.7039 138.2770 138.8501 139.4232 139.9963 140.5694 141.1425 141.7156 142.2887 142.8618 143.4349 144.0080 144.5811 145.1542 145.7273 146.3004 146.8735 147.4466 148.0197 148.5928 149.1659 149.7390 150.3121 150.8852 151.4583 152.0314 152.6045 153.1776 153.7507 154.3238 154.8969 155.4700 156.0431 156.6162 157.1893 157.7624 158.3355 158.9086 159.4817 160.0548 160.6279 161.2010 161.7741 162.3472 162.9203 163.4934 164.0665 164.6396 165.2127 165.7858 166.3589 166.9320 167.5051 168.0782 168.6513 169.2244 169.7975 170.3706 170.9437 171.5168 172.0899 172.6630 173.2361 173.8092 174.3823 174.9554 175.5285 176.1016 176.6747 177.2478 177.8209 178.3940 178.9671 179.5402 180.1133 180.6864 181.2595 181.8326 182.4057 182.9788 183.5519 184.1250 184.6981 185.2712 185.8443 186.4174 186.9905 187.5636 188.1367 188.7098 189.2829 189.8560 190.4291 191.0022 191.5753 192.1484 192.7215 193.2946 193.8677 194.4408 195.0139 195.5870 196.1601 196.7332 197.3063 197.8794 198.4525 199.0256 199.5987 200.1718 200.7449 201.3180 201.8911 202.4642 203.0373 203.6104 204.1835 204.7566 205.3297 205.9028 206.4759 207.0490 207.6221 208.1952 208.7683 209.3414 209.9145 210.4876 211.0607 211.6338 212.2069 212.7800 213.3531 213.9262 214.4993 215.0724 215.6455 216.2186 216.7917 217.3648 217.9379 218.5110 219.0841 219.6572 220.2303 220.8034 221.3765 221.9496 222.5227 223.0958 223.6689 224.2420 224.8151 225.3882 225.9613 226.5344 227.1075 227.6806 228.2537 228.8268 229.3999 229.9730 230.5461 231.1192 231.6923 232.2654 232.8385 233.4116 233.9847 234.5578 235.1309 235.7040 236.2771 236.8502 237.4233 237.9964 238.5695 239.1426 239.7157 240.2888 240.8619 241.4350 242.0081 242.5812 243.1543 243.7274 244.3005 244.8736 245.4467 246.0198 246.5929 247.1660 247.7391 248.3122 248.8853 249.4584 250.0315 250.6046 251.1777 251.7508 252.3239 252.8970 253.4701 254.0432 254.6163 255.1894 255.7625 256.3356 256.9087 257.4818 258.0549 258.6280 259.2011 259.7742 260.3473 260.9204 261.4935 262.0666 262.6397 263.2128 263.7859 264.3590 264.9321 265.5052 266.0783 266.6514 267.2245 267.7976 268.3707 268.9438 269.5169 270.0900 270.6631 271.2362 271.8093 272.3824 272.9555 273.5286 274.1017 274.6748 275.2479 275.8210 276.3941 276.9672 277.5403 278.1134 278.6865 279.2596 279.8327 280.4058 280.9789 281.5520 282.1251 282.6982 283.2713 283.8444 284.4175 284.9906 285.5637 286.1368 286.7099 287.2830 287.8561 288.4292 289.0023 289.5754 290.1485 290.7216 291.2947 291.8678 292.4409 293.0140 293.5871 294.1602 294.7333 295.3064 295.8795 296.4526 297.0257 297.5988 298.1719 298.7450 299.3181 299.8912 300.4643 301.0374 301.6105 302.1836 302.7567 303.3298 303.9029 304.4760 305.0491 305.6222 306.1953 306.7684 307.3415 307.9146 308.4877 309.0608 309.6339 310.2070 310.7801 311.3532 311.9263 312.4994 313.0725 313.6456 314.2187 314.7918 315.3649 315.9380 316.5111 317.0842 317.6573 318.2304 318.8035 319.3766 319.9497 320.5228 321.0959 321.6690 322.2421 322.8152 323.3883 323.9614 324.5345 325.1076 325.6807 326.2538 326.8269 327.3999 327.9730 328.5461 329.1192 329.6923 330.2654 330.8385 331.4116 331.9847 332.5578 333.1309 333.7040 334.2771 334.8502 335.4233 335.9964 336.5695 337.1426 337.7157 338.2888 338.8619 339.4350 340.0081 340.5812 341.1543 341.7274 342.3005 342.8736 343.4467 344.0198 344.5929 345.1660 345.7391 346.3122 346.8853 347.4584 348.0315 348.6046 349.1777 349.7508 350.3239 350.8970 351.4701 352.0432 352.6163 353.1894 353.7625 354.3356 354.9087 355.4818 356.0549 356.6280 357.2011 357.7742 358.3473 358.9204 359.4935 360.0666 360.6397 361.2128 361.7859 362.3590 362.9321 363.5052 364.0783 364.6514 365.2245 365.7976 366.3707 366.9438 367.5169 368.0900 368.6631 369.2362 369.8093 370.3824 370.9555 371.5286 372.1017 372.6748 373.2479 373.8210 374.3941 374.9672 375.5403 376.1134 376.6865 377.2596 377.8327 378.4058 378.9789 379.5520 380.1251 380.6982 381.2713 381.8444 382.4175 382.9906 383.5637 384.1368 384.7099 385.2830 385.8561 386.4292 386.9963 387.5694 388.1425 388.7156 389.2887 389.8618 390.4349 391.0080 391.5811 392.1542 392.7273 393.3004 393.8735 394.4466 395.0197 395.5928 396.1659 396.7390 397.3081 397.8812 398.4543 399.0274 399.6005 400.1736 400.7467 401.3198 401.8929 402.4660 403.0391 403.6122 404.1853 404.7584 405.3315 405.9046 406.4777 407.0508 407.6239 408.1970 408.7701 409.3432 409.9163 410.4894 411.0625 411.6356 412.2087 412.7818 413.3549 413.9280 414.5011 415.0742 415.6473 416.2204 416.7935 417.3666 417.9397 418.5128 419.0859 419.6590 420.2321 420.8052 421.3783 421.9514 422.5245 423.0976 423.6707 424.2438 424.8169 425.3900 425.9631 426.5362 427.1093 427.6824 428.2555 428.8286 429.4017 429.9748 430.5479 431.1210 431.6941 432.2672 432.8403 433.4134 433.9865 434.5596 435.1327 435.7058 436.2789 436.8520 437.4251 437.9982 438.5713 439.1444 439.7175 440.2906 440.8637 441.4368 442.0099 442.5830 443.1561 443.7292 444.3023 444.8754 445.4485 446.0216 446.5947 447.1678 447.7409 448.3140 448.8871 449.4602 450.0333 450.6064 451.1795 451.7526 452.3257 452.8988 453.4719 454.0450 454.6181 455.1912 455.7643 456.3374 456.9105 457.4836 458.0567 458.6298 459.2029 459.7760 460.3491 460.9222 461.4953 462.0684 462.6415 463.2146 463.7877 464.3608 464.9339 465.5070 466.0801 466.6532 467.2263 467.7994 468.3725 468.9456 469.5187 470.0918 470.6649 471.2380 471.8111 472.3842 472.9573 473.5304 474.1035 474.6766 475.2497 475.8228 476.3959 476.9690 477.5421 478.1152 478.6883 479.2614 479.8345 480.4076 480.9807 481.5538 482.1269 482.6999 483.2730 483.8461 484.4192 484.9923 485.5654 486.1385 486.7116 487.2847 487.8578 488.4309 489.0040 489.5771 490.1502 490.7233 491.2964 491.8695 492.4426 493.0157 493.5888 494.1619 494.7350 495.3081 495.8812 496.4543 497.0274 497.6005 498.1736 498.7467 499.3198 499.8929 500.4660 501.0391 501.6122 502.1853 502.7584 503.3315 503.9046 504.4777 505.0508 505.6239 506.1970 506.7701 507.3432 507.9163 508.4894 509.0625 509.6356 510.2087 510.7818 511.3549 511.9280 512.5011 513.0742 513.6473 514.2204 514.7935 515.3666 515.9397 516.5128 517.0859 517.6590 518.2321 518.8052 519.3783 519.9514 520.5245 521.0976 521.6707 522.2438 522.8169 523.3900 523.9631 524.5362 525.1093 525.6824 526.2555 526.8286 527.4017 527.9748 528.5479 529.1210 529.6941 530.2672 530.8403 531.4134 531.9865 532.5596 533.1327 533.7058 534.2789 534.8520 535.4251 535.9982 536.5713 537.1444 537.7175 538.2906 538.8637 539.4368 540.0099 540.5830 541.1561 541.7292 542.3023 542.8754 543.4485 544.0216 544.5947 545.1678 545.7409 546.3140 546.8871 547.4602 548.0333 548.6064 549.1795 549.7526 550.3257 550.8988 551.4719 552.0450 552.6181 553.1912 553.7643 554.3374 554.9105 555.4836 556.0567 556.6298 557.2029 557.7760 558.3491 558.9222 559.4953 560.0684 560.6415 561.2146 561.7877 562.3608 562.9339 563.5070 564.0801 564.6532 565.2263 565.7994 566.3725 566.9456 567.5187 568.0918 568.6649 569.2380 569.8111 570.3842 570.9573 571.5304 572.1035 572.6766 573.2497 573.8228 574.3959 574.9690 575.5421 576.1152 576.6883 577.2614 577.8345 578.4076 578.9807 579.5538 580.1269 580.6999 581.2730 581.8461 582.4192 582.9923 583.5654 584.1385 584.7116 585.2847 585.8578 586.4309 587.0040 587.5771 588.1502 588.7233 589.2964 589.8695 590.4426 591.0157 591.5888 592.1599 592.7330 593.3061 593.8792 594.4523 595.0254 595.5985 596.1716 596.7447 597.3178 597.8909 598.4640 599.0371 599.6102 600.1833 600.7564 601.3295 601.9026 602.4757 603.0488 603.6219 604.1950 604.7681 605.3412 605.9143 606.4874 607.0605 607.6336 608.2067 608.7798 609.3529 609.9260 610.4991 611.0722 611.6453 612.2184 612.7915 613.3646 613.9377 614.5108 615.0839 615.6570 616.2301 616.8032 617.3763 617.9494 618.5225 619.0956 619.6687 620.2418 620.8149 621.3880 621.9571 622.5302 623.1033 623.6764 624.2495 624.8226 625.3957 625.9688 626.5419 627.1150 627.6881 628.2612 628.8343 629.4074 629.9805 630.5536 631.1267 631.6998 632.2729 632.8460 633.4191 633.9922 634.5653 635.1384 635.7115 636.2846 636.8577 637.4308 638.0039 638.5770 639.1501 639.7232 640.2963 640.8694 641.4425 642.0156 642.5887 643.1618 643.7349 644.3080 644.8811 645.4542 646.0273 646.6004 647.1735 647.7466 648.3197 648.8928 649.4659 650.0390 650.6121 651.1852 651.7583 652.3314 652.9045 653.4776 654.0507 654.6238 655.1969 655.7700 656.3431 656.9162 657.4893 658.0624 658.6355 659.2086 659.7817 660.3548 660.9279 661.5010 662.0741 662.6472 663.2203 663.7934 664.3665 664.9396 665.5127 666.0858 666.6589 667.2320 667.8051 668.3782 668.9513 669.5244 670.0975 670.6706 671.2437 671.8168 672.3899 672.9630 673.5361 674.1092 674.6823 675.2554 675.8285 676.4016 676.9747 677.5478 678.1209 678.6940 679.2671 679.8402 680.4133 680.9864 681.5595 682.1326 682.7057 683.2788 683.8519 684.4250 684.9981 685.5712 686.1443 686.7174 687.2905 687.8636 688.4367 689.0098 689.5829 690.1560 690.7291 691.3022 691.8753 692.4484 693.0215 693.5946 694.1677 694.7408 695.3139 695.8870 696.4601 697.0332 697.6063 698.1794 698.7525 699.3256 699.8987 700.4718 701.0449 701.6180 702.1911 702.7642 703.3373 703.9104 704.4835 705.0566 705.6297 706.2028 706.7759 707.3490 707.9221 708.4952 709.0683 709.6414 710.2145 710.7876 711.3607 711.9338 712.5069 713.0800 713.6531 714.2262 714.7993 715.3724 715.9455 716.5186 717.0917 717.6648 718.2379 718.8110 719.3841 719.9572 720.5303 721.1034 721.6765 722.2496 722.8227 723.3958 723.9689 724.5420 725.1151 725.6882 726.2613 726.8344 727.4075 727.9806 728.5537 729.1268 729.6999 730.2730 730.8461 731.4192 731.9923 732.5654 733.1385 733.7116 734.2847 734.8578 735.4309 736.0040 736.5771 737.1502 737.7233 738.2964 738.8695 739.4426 740.0157 740.5888 741.1619 741.7350 742.3081 742.8812 743.4543 744.0274 744.6005 745.1736 745.7467 746.3198 746.8929 747.4660 748.0391 748.6122 749.1853 749.7584 750.3315 750.9046 751.4777 752.0508 752.6239 753.1970 753.7701 754.3432 754.9163 755.4894 756.0625 756.6356 757.2087 757.7818 758.3549 758.9280 759.5011 760.0742 760.6473 761.2204 761.7935 762.3666 762.9397 763.5128 764.0859
```

```
y = A_2*[cos(x); sin(x)]
```

```
y = 2×101  
-6.0000 -6.1765 -6.3287 -6.4559 -6.5576 -6.6334 -6.6830 -6.7063 ...  
-1.0000 -1.5004 -1.9948 -2.4813 -2.9581 -3.4232 -3.8748 -4.3111
```

```
x_ = y(1,:)
```

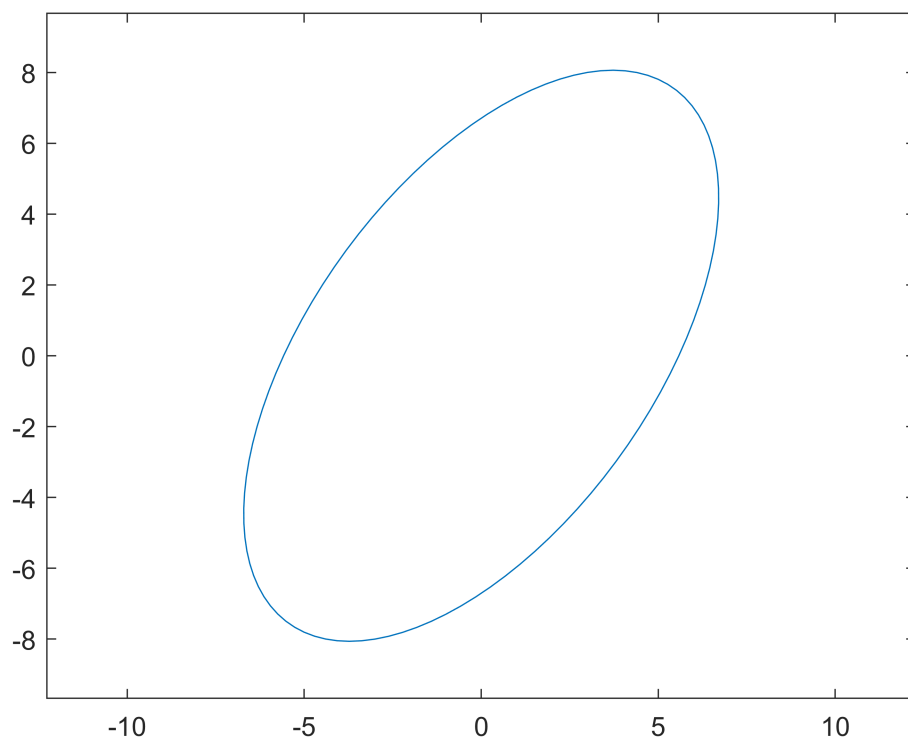
```
x_ = 1×101  
-6.0000 -6.1765 -6.3287 -6.4559 -6.5576 -6.6334 -6.6830 -6.7063 ...
```

```
y_ = y(2,:)
```

```
y_ = 1×101  
-1.0000 -1.5004 -1.9948 -2.4813 -2.9581 -3.4232 -3.8748 -4.3111 ...
```

```
h = plot(x_,y_)
```

```
h =  
Line with properties:  
  
Color: [0 0.4470 0.7410]  
LineStyle: '-'  
LineWidth: 0.5000  
Marker: 'none'  
MarkerSize: 6  
MarkerFaceColor: 'none'  
XData: [-6 -6.1765 -6.3287 -6.4559 -6.5576 -6.6334 -6.6830 -6.7063 -6.7031 -6.6734 -6.6175 -6.5354 -6.4559 -6.3734 -6.2913 -6.2092 -6.1271 -6.0450 -5.9629 -5.8808 -5.7987 -5.7166 -5.6345 -5.5524 -5.4703 -5.3882 -5.3061 -5.2240 -5.1419 -5.0598 -4.9777 -4.8956 -4.8135 -4.7314 -4.6493 -4.5672 -4.4851 -4.4030 -4.3209 -4.2388 -4.1567 -4.0746 -3.9925 -3.9104 -3.8283 -3.7462 -3.6641 -3.5820 -3.5000 -3.4179 -3.3358 -3.2537 -3.1716 -3.0895 -3.0074 -2.9253 -2.8432 -2.7611 -2.6790 -2.5969 -2.5148 -2.4327 -2.3506 -2.2685 -2.1864 -2.1043 -2.0222 -1.9401 -1.8580 -1.7759 -1.6938 -1.6117 -1.5296 -1.4475 -1.3654 -1.2833 -1.2012 -1.1191 -1.0370 -1.0549 -1.0728 -1.0907 -1.1086 -1.1265 -1.1444 -1.1623 -1.1802 -1.1981 -1.2160 -1.2339 -1.2518 -1.2697 -1.2876 -1.3055 -1.3234 -1.3413 -1.3592 -1.3771 -1.3950 -1.4129 -1.4308 -1.4487 -1.4666 -1.4845 -1.5024 -1.5203 -1.5382 -1.5561 -1.5740 -1.5919 -1.6098 -1.6277 -1.6456 -1.6635 -1.6814 -1.6993 -1.7172 -1.7351 -1.7530 -1.7709 -1.7888 -1.8067 -1.8246 -1.8425 -1.8604 -1.8783 -1.8962 -1.9141 -1.9320 -1.9499 -1.9678 -1.9857 -2.0036 -2.0215 -2.0394 -2.0573 -2.0752 -2.0931 -2.1110 -2.1289 -2.1468 -2.1647 -2.1826 -2.2005 -2.2184 -2.2363 -2.2542 -2.2721 -2.2900 -2.3079 -2.3258 -2.3437 -2.3616 -2.3795 -2.3974 -2.4153 -2.4332 -2.4511 -2.4690 -2.4869 -2.5048 -2.5227 -2.5406 -2.5585 -2.5764 -2.5943 -2.6122 -2.6301 -2.6480 -2.6659 -2.6838 -2.7017 -2.7196 -2.7375 -2.7554 -2.7733 -2.7912 -2.8091 -2.8270 -2.8449 -2.8628 -2.8807 -2.8986 -2.9165 -2.9344 -2.9523 -2.9702 -2.9881 -3.0060 -3.0239 -3.0418 -3.0597 -3.0776 -3.0955 -3.1134 -3.1313 -3.1492 -3.1671 -3.1850 -3.2029 -3.2208 -3.2387 -3.2566 -3.2745 -3.2924 -3.3103 -3.3282 -3.3461 -3.3640 -3.3819 -3.4000 -3.4179 -3.4358 -3.4537 -3.4716 -3.4895 -3.5074 -3.5253 -3.5432 -3.5611 -3.5790 -3.5969 -3.6148 -3.6327 -3.6506 -3.6685 -3.6864 -3.7043 -3.7222 -3.7401 -3.7580 -3.7759 -3.7938 -3.8117 -3.8296 -3.8475 -3.8654 -3.8833 -3.9012 -3.9191 -3.9370 -3.9549 -3.9728 -3.9907 -4.0086 -4.0265 -4.0444 -4.0623 -4.0802 -4.0981 -4.1160 -4.1339 -4.1518 -4.1697 -4.1876 -4.2055 -4.2234 -4.2413 -4.2592 -4.2771 -4.2950 -4.3129 -4.3308 -4.3487 -4.3666 -4.3845 -4.4024 -4.4203 -4.4382 -4.4561 -4.4740 -4.4919 -4.5098 -4.5277 -4.5456 -4.5635 -4.5814 -4.5993 -4.6172 -4.6351 -4.6530 -4.6709 -4.6888 -4.7067 -4.7246 -4.7425 -4.7604 -4.7783 -4.7962 -4.8141 -4.8320 -4.8499 -4.8678 -4.8857 -4.9036 -4.9215 -4.9394 -4.9573 -4.9752 -4.9931 -5.0110 -5.0289 -5.0468 -5.0647 -5.0826 -5.1005 -5.1184 -5.1363 -5.1542 -5.1721 -5.1900 -5.2079 -5.2258 -5.2437 -5.2616 -5.2795 -5.2974 -5.3153 -5.3332 -5.3511 -5.3690 -5.3869 -5.4048 -5.4227 -5.4406 -5.4585 -5.4764 -5.4943 -5.5122 -5.5301 -5.5480 -5.5659 -5.5838 -5.6017 -5.6196 -5.6375 -5.6554 -5.6733 -5.6912 -5.7091 -5.7270 -5.7449 -5.7628 -5.7807 -5.7986 -5.8165 -5.8344 -5.8523 -5.8702 -5.8881 -5.9060 -5.9239 -5.9418 -5.9597 -5.9776 -5.9955 -6.0134 -6.0313 -6.0492 -6.0671 -6.0850 -6.1029 -6.1208 -6.1387 -6.1566 -6.1745 -6.1924 -6.2103 -6.2282 -6.2461 -6.2640 -6.2819 -6.2998 -6.3177 -6.3356 -6.3535 -6.3714 -6.3893 -6.4072 -6.4251 -6.4430 -6.4609 -6.4788 -6.4967 -6.5146 -6.5325 -6.5504 -6.5683 -6.5862 -6.6041 -6.6220 -6.6399 -6.6578 -6.6757 -6.6936 -6.7115 -6.7294 -6.7473 -6.7652 -6.7831 -6.8010 -6.8189 -6.8368 -6.8547 -6.8726 -6.8905 -6.9084 -6.9263 -6.9442 -6.9621 -6.9800 -6.9979 -7.0158 -7.0337 -7.0516 -7.0695 -7.0874 -7.1053 -7.1232 -7.1411 -7.1590 -7.1769 -7.1948 -7.2127 -7.2306 -7.2485 -7.2664 -7.2843 -7.3022 -7.3201 -7.3380 -7.3559 -7.3738 -7.3917 -7.4096 -7.4275 -7.4454 -7.4633 -7.4812 -7.4991 -7.5170 -7.5349 -7.5528 -7.5707 -7.5886 -7.6065 -7.6244 -7.6423 -7.6602 -7.6781 -7.6960 -7.7139 -7.7318 -7.7497 -7.7676 -7.7855 -7.8034 -7.8213 -7.8392 -7.8571 -7.8750 -7.8929 -7.9108 -7.9287 -7.9466 -7.9645 -7.9824 -7.9999 -8.0174 -8.0349 -8.0524 -8.0699 -8.0874 -8.1049 -8.1224 -8.1399 -8.1574 -8.1749 -8.1924 -8.2099 -8.2274 -8.2449 -8.2624 -8.2799 -8.2974 -8.3149 -8.3324 -8.3499 -8.3674 -8.3849 -8.4024 -8.4199 -8.4374 -8.4549 -8.4724 -8.4899 -8.5074 -8.5249 -8.5424 -8.5599 -8.5774 -8.5949 -8.6124 -8.6299 -8.6474 -8.6649 -8.6824 -8.6999 -8.7174 -8.7349 -8.7524 -8.7699 -8.7874 -8.8049 -8.8224 -8.8399 -8.8574 -8.8749 -8.8924 -8.9099 -8.9274 -8.9449 -8.9624 -8.9799 -8.9974 -9.0149 -9.0324 -9.0499 -9.0674 -9.0849 -9.1024 -9.1199 -9.1374 -9.1549 -9.1724 -9.1899 -9.2074 -9.2249 -9.2424 -9.2599 -9.2774 -9.2949 -9.3124 -9.3299 -9.3474 -9.3649 -9.3824 -9.3999 -9.4174 -9.4349 -9.4524 -9.4699 -9.4874 -9.5049 -9.5224 -9.5399 -9.5574 -9.5749 -9.5924 -9.6099 -9.6274 -9.6449 -9.6624 -9.6799 -9.6974 -9.7149 -9.7324 -9.7499 -9.7674 -9.7849 -9.8024 -9.8199 -9.8374 -9.8549 -9.8724 -9.8899 -9.9074 -9.9249 -9.9424 -9.9599 -9.9774 -9.9949 -10.0124 -10.0299 -10.0474 -10.0649 -10.0824 -10.0999 -10.1174 -10.1349 -10.1524 -10.1699 -10.1874 -10.2049 -10.2224 -10.2399 -10.2574 -10.2749 -10.2924 -10.3099 -10.3274 -10.3449 -10.3624 -10.3799 -10.3974 -10.4149 -10.4324 -10.4499 -10.4674 -10.4849 -10.5024 -10.5199 -10.5374 -10.5549 -10.5724 -10.5899 -10.6074 -10.6249 -10.6424 -10.6599 -10.6774 -10.6949 -10.7124 -10.7299 -10.7474 -10.7649 -10.7824 -10.7999 -10.8174 -10.8349 -10.8524 -10.8699 -10.8874 -10.9049 -10.9224 -10.9399 -10.9574 -10.9749 -10.9924 -11.0099 -11.0274 -11.0449 -11.0624 -11.0799 -11.0974 -11.1149 -11.1324 -11.1499 -11.1674 -11.1849 -11.2024 -11.2199 -11.2374 -11.2549 -11.2724 -11.2899 -11.3074 -11.3249 -11.3424 -11.3599 -11.3774 -11.3949 -11.4124 -11.4299 -11.4474 -11.4649 -11.4824 -11.4999 -11.5174 -11.5349 -11.5524 -11.5699 -11.5874 -11.6049 -11.6224 -11.6399 -11.6574 -11.6749 -11.6924 -11.7099 -11.7274 -11.7449 -11.7624 -11.7799 -11.7974 -11.8149 -11.8324 -11.8499 -11.8674 -11.8849 -11.9024 -11.9199 -11.9374 -11.9549 -11.9724 -11.9899 -12.0074 -12.0249 -12.0424 -12.0599 -12.0774 -12.0949 -12.1124 -12.1299 -12.1474 -12.1649 -12.1824 -12.1999 -12.2174 -12.2349 -12.2524 -12.2699 -12.2874 -12.3049 -12.3224 -12.3399 -12.3574 -12.3749 -12.3924 -12.4099 -12.4274 -12.4449 -12.4624 -12.4799 -12.4974 -12.5149 -12.5324 -12.5499 -12.5674 -12.5849 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```



Выводы

В домашнем задании повторили вычисления матричных инвариантов и неинвариантов, а также определение подобия матриц. Выяснили, что матрицы A_1 и A_2 подобны, построили отображения единичной сферы в эллипсоиды = матриц A_1 и A_2 .