

Project #3B:
Solving Systems of Linear Equations

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MA375
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Matrix Equation A:

Using the given matrices for matrix equation A and the gaussian elimination method created, I was able to achieve the solution:

$$[0 \ 1 \ 2 \ 3 \ 4]^T$$

```
henry@Henrys-MacBook-Pro project3 % python3 GaussianElimination.py
MA375 - Project #3B
Henry Song

1. Use matrix equation A from Project 3B
2. Use matrix equation B from Project 3B
3. Use custom matrix equation
4. Use randomly generated matrix
5. Quits program
Please select an option: 1

A =
| 14  14  -9   3  -5 |
| 14  52 -15   2 -32 |
| -9 -15  36  -5  16 |
| 3   2  -5  47  49 |
| -5 -32  16  49  79 |

B =
| -15.0000 |
| -100.0000 |
| 106.0000 |
| 329.0000 |
| 463.0000 |

Option 1: x = | -0.0000  1.0000  2.0000  3.0000  4.0000 |

1. Use matrix equation A from Project 3B
2. Use matrix equation B from Project 3B
3. Use custom matrix equation
4. Use randomly generated matrix
5. Quits program
Please select an option: █
```

Matrix Equation B:

Using the given matrices for matrix equation A and the gaussian elimination method created, I was able to achieve the solution:

$$[0 \ 1 \ 2 \ 3 \ 4]^T$$

```
henry@Henrys-MacBook-Pro project3 % python3 GaussianElimination.py
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1. Use matrix equation A from Project 3B
2. Use matrix equation B from Project 3B
3. Use custom matrix equation
4. Use randomly generated matrix
5. Quits program
Please select an option: 2

A =
| 9      3      2      0      7 |
| 7      6      9      6      4 |
| 2      7      7      8      2 |
| 0      9      7      2      2 |
| 7      3      6      4      3 |

B =
| 35.0000 |
| 58.0000 |
| 53.0000 |
| 37.0000 |
| 39.0000 |

Option 2: x = | -0.0000  1.0000  2.0000  3.0000  4.0000 |

1. Use matrix equation A from Project 3B
2. Use matrix equation B from Project 3B
3. Use custom matrix equation
4. Use randomly generated matrix
5. Quits program
Please select an option: █
```

Solving other matrices:

These matrices are generated using a manually entered size and filled with randomly generated integers. I apologize in advance for the tiny pictures, especially as the matrix gets larger. Normal resolution pictures are also included as stand-alone images in submission folder.

<p>2x2 matrix:</p> <pre>1. Use matrix equation A from Project 3B 2. Use matrix equation B from Project 3B 3. Use custom matrix equation 4. Use randomly generated matrix 5. Quits program Please select an option: 4 Enter size of desired random matrix: 2 A = 228 743 527 174 B = 760.0000 591.0000 Option 4: x = 0.8721 0.7553 </pre>	<p>3x3 matrix:</p> <pre>1. Use matrix equation A from Project 3B 2. Use matrix equation B from Project 3B 3. Use custom matrix equation 4. Use randomly generated matrix 5. Quits program Please select an option: 4 Enter size of desired random matrix: 3 A = 579 345 430 473 863 215 398 748 723 B = 671.0000 384.0000 864.0000 Option 4: x = 0.4451 -0.0480 0.9997 </pre>
<p>4x4 matrix:</p> <pre>1. Use matrix equation A from Project 3B 2. Use matrix equation B from Project 3B 3. Use custom matrix equation 4. Use randomly generated matrix 5. Quits program Please select an option: 4 Enter size of desired random matrix: 4 A = 249 299 806 556 586 873 272 907 794 158 85 787 677 787 498 387 B = 574.0000 321.0000 52.0000 518.0000 Option 4: x = 0.0549 0.2315 0.6851 -0.1098 </pre>	<p>5x5 matrix:</p> <pre>1. Use matrix equation A from Project 3B 2. Use matrix equation B from Project 3B 3. Use custom matrix equation 4. Use randomly generated matrix 5. Quits program Please select an option: 4 Enter size of desired random matrix: 5 A = 457 889 258 653 958 928 839 651 680 410 675 476 593 95 498 387 465 619 666 440 884 831 178 727 188 B = 901.0000 638.0000 912.0000 418.0000 554.0000 Option 4: x = 2.4044 -2.6581 -0.9485 0.5566 2.1362 </pre>

6x6 matrix:

```
1. Use matrix equation A from Project 3B
2. Use matrix equation B from Project 3B
3. Use custom matrix equation
4. Use randomly generated matrix
5. Quits program
Please select an option: 4
```

Enter size of desired random matrix: 6

```
A =
| 389 217 681 362 502 90 |
| 352 559 941 443 177 482 |
| 540 807 299 233 787 681 |
| 709 780 689 959 450 526 |
| 183 911 261 547 242 511 |
| 717 667 355 624 282 903 |
```

```
B =
| 587.0000 |
| 645.0000 |
| 627.0000 |
| 949.0000 |
| 111.0000 |
| 306.0000 |
```

Option 4: x = | 5.2366 3.3675 0.4267 -2.7490 -2.2463 -3.8731 |

7x7 matrix:

```
1. Use matrix equation A from Project 3B
2. Use matrix equation B from Project 3B
3. Use custom matrix equation
4. Use randomly generated matrix
5. Quits program
Please select an option: 4
```

Enter size of desired random matrix: 7

```
A =
| 672 854 687 791 448 372 346 |
| 413 251 457 653 268 707 916 |
| 304 835 615 895 486 933 445 |
| 808 647 845 452 697 273 548 |
| 98 22 800 329 289 42 536 |
| 430 822 637 847 560 924 633 |
| 535 461 944 643 371 357 619 |
```

```
B =
| 632.0000 |
| 376.0000 |
| 834.0000 |
| 963.0000 |
| 24.0000 |
| 692.0000 |
| 230.0000 |
```

Option 4: x = | 1.9965 -4.4272 -0.8400 3.0589 4.2427 1.1111 -3.1370 |

8x8 matrix:

Enter size of desired random matrix: 8

```
A =
| 102 179 423 47 562 724 912 38 |
| 767 990 274 802 293 944 308 147 |
| 67 884 675 575 422 375 127 443 |
| 847 857 36 972 720 139 894 148 |
| 764 95 927 493 863 45 273 508 |
| 43 945 442 901 437 258 95 928 |
| 44 525 375 151 518 499 592 209 |
| 289 436 363 179 101 53 913 472 |
```

```
B =
| 690.0000 |
| 116.0000 |
| 265.0000 |
| 487.0000 |
| 646.0000 |
| 46.0000 |
| 243.0000 |
| 561.0000 |
```

Option 4: x = | -0.3081 -0.6327 0.9470 0.9693 -0.3999 -0.1071 0.7802 -0.5458 |

9x9 matrix:

Enter size of desired random matrix: 9

```
A =
| 138 747 657 809 83 230 526 235 690 |
| 395 653 206 233 881 104 559 598 255 |
| 997 634 383 787 688 292 208 329 807 |
| 672 69 399 943 685 322 174 312 722 |
| 749 609 503 484 946 582 791 84 879 |
| 389 591 276 568 255 56 705 783 447 |
| 397 627 148 407 23 499 73 697 192 |
| 703 666 568 30 801 122 817 455 441 |
| 2 527 827 936 618 821 100 595 37 |
```

```
B =
| 642.0000 |
| 615.0000 |
| 636.0000 |
| 544.0000 |
| 237.0000 |
| 610.0000 |
| 113.0000 |
| 0.0000 |
| 120.0000 |
```

Option 4: x = | -0.6231 0.5739 -0.7194 0.7238 0.4995 -0.8009 -0.2375 0.1449 0.6086 |

10x10 matrix:

Enter size of desired random matrix: 10

```
A =
| 420 351 561 24 589 972 780 101 994 179 |
| 237 767 105 409 937 901 728 182 28 344 |
| 688 243 20 498 805 841 298 648 938 491 |
| 180 365 989 96 85 342 942 899 22 332 |
| 969 862 235 914 688 348 485 358 969 427 |
| 238 655 867 872 432 217 735 740 595 956 |
| 131 248 996 415 204 697 779 406 667 694 |
| 482 465 630 242 348 254 284 386 827 176 |
| 316 24 359 104 776 902 700 663 221 318 |
| 4 201 234 283 781 523 42 908 442 31 |
```

```
B =
| 658.0000 |
| 777.0000 |
| 46.0000 |
| 671.0000 |
| 442.0000 |
| 578.0000 |
| 226.0000 |
| 439.0000 |
| 686.0000 |
| 946.0000 |
```

Option 4: x = | -0.7291 -0.0566 0.3297 0.2538 1.3576 -0.7862 0.9592 0.0769 0.1921 -1.0571 |

10x10 matrix:

Enter size of desired random matrix: 10

```
A =
| 989 830 140 172 978 164 153 443 686 685 |
| 127 503 915 538 333 794 557 446 539 293 |
| 724 147 700 80 300 724 463 88 801 764 |
| 12 932 986 737 759 226 237 87 784 237 |
| 753 624 724 942 934 429 79 249 224 465 |
| 341 472 422 687 424 7 326 686 278 573 |
| 531 612 809 343 541 48 688 208 760 491 |
| 335 938 202 617 851 622 950 618 319 211 |
| 472 866 403 518 844 269 751 891 993 833 |
| 305 31 929 548 23 109 363 915 855 961 |
```

```
B =
| 915.0000 |
| 585.0000 |
| 518.0000 |
| 662.0000 |
| 423.0000 |
| 514.0000 |
| 835.0000 |
| 376.0000 |
| 114.0000 |
| 571.0000 |
```

Option 4: x = | 6.2506 4.3139 -3.2894 5.7250 -9.3137 0.2945 -1.1414 -0.6807 5.2419 -5.0086 |

Source Code:

- Song_Henry_Project3.zip
 - Project Report.pdf
 - GaussianElimination.py
 - /matrix_calculation_images
 - 2x2.png
 - 3x3.png
 - 4x4.png
 - 5x5.png
 - 6x6.png
 - 7x7.png
 - 8x8.png
 - 9x9.png
 - 10x10_1.png
 - 10x10_2.png
- GitHub
 - <https://github.com/henrysong671/MA375-Project2>