Name:

|  |  |  |
| --- | --- | --- |
| Problem | Points | Score |
| 1 | 25 |  |
| 2 | 25 |  |
| 3 | 25 |  |
| 4 | 25 |  |
| Total | 100 |  |

Notes: The exam is closed book and closed notes.

**(25 pts) Problem No. 1**:

Find a matrix whose eigenvalues are and , and whose eigenvectors are and . Is this answer unique?

**Problem No. 2**:

**(25 pts)** Find the eigenvalues for . Explain why this answer makes sense.

**(25 pts) Problem No. 3**:

Are the vectors , , and in the same plane? Justify your conclusions with detailed calculations – guessing yes or no with no supporting work gets you no credit. You will be graded on the thoroughness of your solution.

**(25 pts) Problem No. 4**: Solve the second-order differential equation (find ) by converting it to two first-order differential equations: . Note that , and .