Name:

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| --- | --- | --- |
| 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 $A$ whose eigenvalues are $-2$ and $4$, and whose eigenvectors are $[-1, 1]$ and $[5, 1]$. Is this answer unique?

**Problem No. 2**:

**(25 pts)** Find the eigenvalues for $A=\left[\begin{matrix}2&-1\\2&0\end{matrix}\right]$. Explain why this answer makes sense.

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

Are the vectors $\vec{u}=[1,2,-4]$, $\vec{v}=[-5,3,-7]$, and $\vec{w}=[-1,4,2]$ 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 $y(t)$) by converting it to two first-order differential equations: $2y^{''}+5y^{'}-3y=0,y(0)=-4,y'(0)=9$. Note that $y^{'}={dy}/{dt}$, and $y^{''}={d^{2}y}/{dt^{2}}$.