MATH 238 Sochacki Assignment 2 Name____
Due Mar. 26, 2021 50 Points (Print) (1 point)

All necessary work must be shown for credit and must represent the question asked. Your work MUST be NEAT and your own and done in PENCIL. You may NOT use computers, notes or texts to look up answers. You may discuss the home work with others in this class, but you must do your own write up. Calculators and computers are only allowed for arithmetic calculations. You must turn the assignment in at the mailbox next to my office door at Roop Hall 115.

I have neither received nor given help on this exam.

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(Signature) (1 point)

1. **Show** whether or not the following are vector spaces. (6 points each)

(a) The $A \epsilon M_n$ that are invertible.

(b) The polynomials satisfying $p(0) = p'(1)$.

2. **Show** whether or not $1 + x + x^2 + x^3 \epsilon$ span$\{2x^3, 1 - x + 2x^2, 3x - x^2\}$. (6 points)

3. **Show** whether or not $B = \left\{ \begin{pmatrix} 1 & -1 \\ -2 & 2 \end{pmatrix}, \begin{pmatrix} -2 & 2 \\ 1 & -1 \end{pmatrix}, \begin{pmatrix} 1 & -2 \\ -1 & 2 \end{pmatrix}, \begin{pmatrix} 1 & -2 \\ -4 & 5 \end{pmatrix} \right\}$ is a basis for M_2. (6 points)

4. Give a basis for the NS(A) and the CS(A) and the dimension of each for $A = \begin{pmatrix} 3 & 1 & -3 & -1 \\ 1 & 0 & 2 & 0 \\ 1 & 1 & 5 & 4 \end{pmatrix}$. (12 points).

5. Give a phase portrait for the differential equation $y' = 4y - y^3$. Be sure to include the equilibrium solutions, the concavity and enough possible solutions. (12 points)