F16 8:40 Exam 2 Problem 1
Linear Algebra, Dave Bayer

test1a2p1

[Reserved for Score]

Test 1

Name ______________________ Uni ____________

[1] Find the determinant of the matrix

$$A = \begin{bmatrix} 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & 3 & 3 & 3 \\ 0 & 1 & 1 & 5 & 5 \\ 2 & 2 & 2 & 2 & 2 \\ 0 & 1 & 1 & 1 & 7 \end{bmatrix}$$

$\det(A) = \boxed{}$

F16 8:40 Exam 2 Problem 2
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test1a2p2

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Test 1

[2] Find the inverse to the matrix

$$A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 2 & 3 \\ 0 & 1 & 1 \end{bmatrix}$$

$$A^{-1} = \frac{1}{\boxed{}} \begin{bmatrix} \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \end{bmatrix}$$

F16 8:40 Exam 2 Problem 3
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test1a2p3

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Test 1

[3] Using Cramer's rule, solve for x in the system of equations

$$\begin{bmatrix} 1 & a & 0 \\ 2 & b & 1 \\ 4 & c & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 5 \end{bmatrix}$$

$$x = \frac{\left(\boxed{}\right) a + \left(\boxed{}\right) b + \left(\boxed{}\right) c}{\left(\boxed{}\right) a + \left(\boxed{}\right) b + \left(\boxed{}\right) c}$$

test1a2p4

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Test 1

[4] Find a system of eigenvalues and eigenvectors for the matrix A, and find a formula for A^n, where

$$A = \begin{bmatrix} 3 & 1 \\ 4 & 6 \end{bmatrix}$$

$$\lambda_1,\ \lambda_2 = \boxed{},\ \boxed{}$$

$$v_1,\ v_2 = \begin{bmatrix} \boxed{} \\ \boxed{} \end{bmatrix},\ \begin{bmatrix} \boxed{} \\ \boxed{} \end{bmatrix}$$

$$A^n = \frac{\boxed{}}{\boxed{}} \begin{bmatrix} \boxed{} & \boxed{} \\ \boxed{} & \boxed{} \end{bmatrix} + \frac{\boxed{}}{\boxed{}} \begin{bmatrix} \boxed{} & \boxed{} \\ \boxed{} & \boxed{} \end{bmatrix}$$

F16 8:40 Exam 2 Problem 5
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test1a2p5

[Reserved for Score]

Test 1

[5] Let $f(n)$ be the determinant of the $n \times n$ matrix in the sequence

$$[\,] \qquad [\,1\,] \qquad \begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix} \qquad \begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & -1 \\ 0 & 2 & 1 \end{bmatrix} \qquad \begin{bmatrix} 1 & -1 & 0 & 0 \\ 2 & 1 & -1 & 0 \\ 0 & 2 & 1 & -1 \\ 0 & 0 & 2 & 1 \end{bmatrix} \qquad \begin{bmatrix} 1 & -1 & 0 & 0 & 0 \\ 2 & 1 & -1 & 0 & 0 \\ 0 & 2 & 1 & -1 & 0 \\ 0 & 0 & 2 & 1 & -1 \\ 0 & 0 & 0 & 2 & 1 \end{bmatrix}$$

Find a recurrence relation for $f(n)$. Express $f(n)$ using a matrix power. Find a formula for $f(n)$.

$$f(n) = (\quad)\, f(n-1) + (\quad)\, f(n-2)$$

$$\begin{bmatrix} f(n) \\ f(n+1) \end{bmatrix} = \begin{bmatrix} \quad & \quad \\ \quad & \quad \end{bmatrix}^n \begin{bmatrix} f(0) \\ f(1) \end{bmatrix}$$

$$f(n) =$$