F18 Homework 3 Problem 1
Linear Algebra, Dave Bayer

test1b3p1

[Reserved for Score]

Test 1

Name ______________________ Uni ______________

[1] Find the general solution to the following system of equations.

$$\begin{bmatrix} 0 & 0 & 3 & 1 & 2 \\ 1 & 0 & 4 & 1 & 5 \end{bmatrix} \begin{bmatrix} v \\ w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$$

$$\begin{bmatrix} v \\ w \\ x \\ y \\ z \end{bmatrix} =$$

Test 1

[2] Find the intersection of the following two affine subspaces of $\mathbb{R}^4$.

$$\begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \\ 1 & 1 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} q \\ r \end{bmatrix}, \qquad \begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \\ 1 \end{bmatrix} + \begin{bmatrix} 1 & 1 \\ 1 & 1 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} s \\ t \end{bmatrix}$$

$$\boxed{\begin{bmatrix} w \\ x \\ y \\ z \end{bmatrix} = \qquad\qquad}$$

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Test 1

[3] Consider $\mathbb{R}^3$ equipped with the inner product

$$\langle (a,b,c),(d,e,f)\rangle \;=\; \begin{bmatrix} a & b & c \end{bmatrix} \begin{bmatrix} 2 & 1 & 0 \\ 1 & 1 & 1 \\ 0 & 1 & 3 \end{bmatrix} \begin{bmatrix} d \\ e \\ f \end{bmatrix}$$

Using this inner product, find the orthogonal projection of the vector $(6,6,6)$ onto the plane spanned by $(1,0,0)$ and $(0,0,1)$.

$$\boxed{\begin{bmatrix} \square & \square & \square \end{bmatrix}}$$

F18 Homework 3 Problem 4
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test1b3p4

[Reserved for Score]

Test 1

[4] Find e^{At} where A is the matrix

$$A = \begin{bmatrix} -4 & 1 \\ -1 & -2 \end{bmatrix}$$

$$\boxed{e^{At} = \frac{\square}{\square}\begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix} + \frac{\square}{\square}\begin{bmatrix} \square & \square \\ \square & \square \end{bmatrix}}$$

F18 Homework 3 Problem 5
Linear Algebra, Dave Bayer

test1b3p5

[Reserved for Score]

Test 1

[5] Find e^{At} where A is the matrix

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

$$e^{At} = \frac{\square}{\square}\begin{bmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{bmatrix} + \frac{\square}{\square}\begin{bmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{bmatrix} + \frac{\square}{\square}\begin{bmatrix} \square & \square & \square \\ \square & \square & \square \\ \square & \square & \square \end{bmatrix}$$

F18 Homework 3 Problem 6
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test1b3p6

[Reserved for Score]

Test 1

[6] Find e^{At} where A is the matrix

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

$$e^{At} \;=\; \frac{\boxed{}}{\boxed{}} \begin{bmatrix} \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \end{bmatrix} + \frac{\boxed{}}{\boxed{}} \begin{bmatrix} \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \end{bmatrix} + \frac{\boxed{}}{\boxed{}} \begin{bmatrix} \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \\ \boxed{} & \boxed{} & \boxed{} \end{bmatrix}$$

F18 Homework 3 Problem 7
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test1b3p7

[Reserved for Score]

Test 1

[7] Solve the differential equation $y' = Ay$ where

$$A \;=\; \begin{bmatrix} 1 & 1 & 1 \\ 2 & 1 & 2 \\ 1 & 0 & 1 \end{bmatrix}, \qquad y(0) \;=\; \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$$

$$y \;=\; \frac{\boxed{}}{\boxed{}}\begin{bmatrix} \boxed{} \\ \boxed{} \\ \boxed{} \end{bmatrix} + \frac{\boxed{}}{\boxed{}}\begin{bmatrix} \boxed{} \\ \boxed{} \\ \boxed{} \end{bmatrix} + \frac{\boxed{}}{\boxed{}}\begin{bmatrix} \boxed{} \\ \boxed{} \\ \boxed{} \end{bmatrix}$$

F18 Homework 3 Problem 8
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test1b3p8

[Reserved for Score]

Test 1

[8] Express the quadratic form

$$-2x^2 - 2xy - 3y^2 + 2xz - 3z^2$$

as a sum of squares of othogonal linear forms.

$$\boxed{\square\left(\qquad\right)^2 + \square\left(\qquad\right)^2 + \square\left(\qquad\right)^2}$$