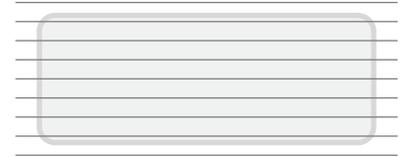




Test 1

Name _____ Uni _____



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

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





Test 1

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

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

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



Test 1

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

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

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

[<input type="text"/> <input type="text"/> <input type="text"/>]
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Test 1

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

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

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



Test 1

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

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

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



Test 1

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

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

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



Test 1

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

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

$$y = \frac{\begin{bmatrix} \square \\ \square \end{bmatrix}}{\begin{bmatrix} \square \\ \square \end{bmatrix}} + \frac{\begin{bmatrix} \square \\ \square \end{bmatrix}}{\begin{bmatrix} \square \\ \square \end{bmatrix}} + \frac{\begin{bmatrix} \square \\ \square \end{bmatrix}}{\begin{bmatrix} \square \\ \square \end{bmatrix}}$$



Test 1

[8] Express the quadratic form

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

as a sum of squares of orthogonal linear forms.

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