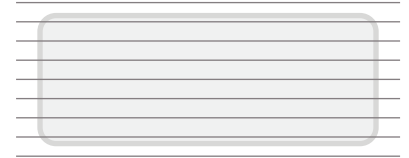




Test 1

Name \_\_\_\_\_ Uni \_\_\_\_\_



[1] By least squares, find the equation of the form  $y = ax + b$  that best fits the data

$$\begin{bmatrix} x_1 & y_1 \\ x_2 & y_2 \\ x_3 & y_3 \\ x_4 & y_4 \end{bmatrix} = \begin{bmatrix} -1 & 1 \\ 0 & 0 \\ 1 & 1 \\ 2 & 1 \end{bmatrix}$$

$y = \boxed{\phantom{000}} x + \boxed{\phantom{000}}$



Test 1

[2] Find the inverse of the matrix

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

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

(Do not write a negative denominator.)



Test 1

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

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

Using this inner product, find the orthogonal projection of the vector  $(3, 3, 3)$  onto the plane spanned by  $(1, 0, 0)$  and  $(0, 1, 0)$ .

|  |
|--|
| [ <input type="text"/> <input type="text"/> <input type="text"/> ] |
|--|



Test 1

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

$$[2] \quad \begin{bmatrix} 2 & 5 \\ 1 & 2 \end{bmatrix} \quad \begin{bmatrix} 2 & 5 & 0 \\ 1 & 2 & 5 \\ 0 & 1 & 2 \end{bmatrix} \quad \begin{bmatrix} 2 & 5 & 0 & 0 \\ 1 & 2 & 5 & 0 \\ 0 & 1 & 2 & 5 \\ 0 & 0 & 1 & 2 \end{bmatrix}$$

Find  $f(1)$  and  $f(2)$ . Find a recurrence relation for  $f(n)$ . Find  $f(6)$ .

|           |                      |             |                      |          |
|-----------|----------------------|-------------|----------------------|----------|
| $f(1) = $ | <input type="text"/> | $f(2) = $   | <input type="text"/> |          |
| $f(n) = $ | <input type="text"/> | $f(n-1) + $ | <input type="text"/> | $f(n-2)$ |
| $f(6) = $ | <input type="text"/> |             |                      |          |



Test 1

[5] Find a system of eigenvalues and eigenvectors for the matrix  $A$ , where

$$A = \begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$$

$$\lambda_1, \lambda_2 = \boxed{\phantom{0}}, \boxed{\phantom{0}}$$
$$v_1, v_2 = \begin{bmatrix} \boxed{\phantom{0}} \\ \boxed{\phantom{0}} \end{bmatrix}, \begin{bmatrix} \boxed{\phantom{0}} \\ \boxed{\phantom{0}} \end{bmatrix}$$