REVIEW
TEST 3

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Find the point of intersection (if any) of the following pairs of lines.

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ -1 \\ 5 \end{bmatrix} + t \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 2 \\ -7 \\ 12 \end{bmatrix} + s \begin{bmatrix} 0 \\ -2 \\ 3 \end{bmatrix}$$

Find normal vector of the plane through P(1,2,1), Q(0,-3,2) and R(1,1,4)

Find a vector equation of the line. Passing through $P(3, -1, 4)$ and perpendicular to the plane $3x - 2y - z = 0$

Let $u = \begin{bmatrix} 3 \\ -1 \\ 0 \end{bmatrix}, v = \begin{bmatrix} 4 \\ 0 \\ 1 \end{bmatrix}, \mathrm{w} = \begin{bmatrix} -1 \\ 1 \\ 5 \end{bmatrix}$

In each case, find x such that: 3(2u + x) + w = 2x – v.

The area of the parallelogram determined by the given vector u and v. u=(-1,1,2), v=(0,2,1)

Find the angle between the following pair of vectors.

$$u = \begin{bmatrix} 2 \\ 1 \\ -1 \end{bmatrix}, v = \begin{bmatrix} 3 \\ 6 \\ 3 \end{bmatrix}$$

Let A be a 30x70 matrix and rank(A)=40. Find
Dim(colA)
Dim(rowA)
Dim(nullA)

In each case, computer the projection of u on v

$$u = \begin{bmatrix} 3 \\ -2 \\ -1 \end{bmatrix}, v = \begin{bmatrix} -6 \\ 4 \\ 2 \end{bmatrix}$$

Find the parametric equation of the line passing though P(1,0,-3) and parallel to the line with parametric equation

$$x = -1 + 2t, y = 2 - t, z = 3 + 3t$$

Find all real numbers x such that $\begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix}$ and $\begin{bmatrix} 1 \\ x \\ -1 \end{bmatrix}$ are orthogonal.

Let $\|X\| = 4, \|Y\| = 3, XY = 2$. Calculate $\|2X - 3Y\|$?

A. 11 B. 1 C. -1 D. $\sqrt{145}$

Find the three internal angles of the triangle with vertices: A(3, 1, -2), B(3, 0, -1), and C(5, 2, -1).

Let A be a 4x6 matrix of rank 2. Find the dimension of the null space of A.

Find the dimension of the subspace

$$U = \{[a \quad a-b \quad a+3b \quad a] \mid a, b \text{ are real numbers}\}$$

Find the area of the triangle with the following vertices.
$A(3, -1, 1)$, $B(4, 1, 0)$, and $C(2, -3, 0)$

a) $\sqrt{2}$ b) 2 c) $\sqrt{5}$ d) $\sqrt{3}$

Consider the triangle with vertices P (2, 0, -3), Q (5, -2, 1), and R (7, 5, 3). Find the lengths of the three sides

The dimension of the subspace
U=span{(-2, 0, 3), (1, 2, -1),(-2, 8, 5),(-1, 2, 2)} is…

a. 2

b. 4

c. 3

d. 1

Let u and v be vectors in R^3 and $w \in \text{span}\{u,v\}$.

Then …

a. {u,v,w} is linearly dependent.

b. {u,v,w} is linearly independent.

c. {u,v,w} is a basis of R^3

d. the subspace is spanned by {u,v,w} has the dimension 3.

Find a basis for the subspace of R^3 defined by

U={(a,b,c): 2a-b+3c=0}

a. {(1,2,0), (0,3,1)}

b. {(1,0,0), (0,1,0), (0,0,1)}

c. {(1,2,0)}

d. {(1,0,0), (1,2,0)}

e. {(3,0,-2), (1,0,0}

f. {(2,-1,3)}

Which of the following are subspaces of $\mathbb{R}^3$?

(i) $U = \{(x, y, z + 2) \mid x, y, z \in \mathbb{R}\}$

(ii) $U = \{(x, y, z) \mid x + 3y - 2z = 0\}$

(iii) $U = \{(x, y, z) \mid x + y + z^2 = 3\}$

(iv) $U = \{(x, y, |z|) \mid x, y, z \in \mathbb{R}\}$

Let U = span{(1, 1, 2, 1), (0, 1, 1, -2)}.
Find all values of t such that (1, t, 3, 4) is in U

a. There is no such t
b. -2
c. All nonzero numbers
d. None of the other choices is correct
e. All number different from -1

Which of the following subsets are independent in $\mathbb{R}^4$?

$(i)\left\{[1 \quad 2 \quad 3 \quad 4]^T, [2 \quad 0 \quad 1 \quad -1]^T, [1 \quad -1 \quad 0 \quad 3]^T\right\}$

$(ii)\left\{[2 \quad 0 \quad 1 \quad -1]^T, [1 \quad 2 \quad -1 \quad 1]^T, [3 \quad 2 \quad 0 \quad 0]^T\right\}$

Let u, v be linearly independent vectors in R^5. Let
U = span{u, v, 2u + 3v, u – v}.
Find dimU.

a. There is not enough information
b. 3
c. None of the other choices is correct
d. 5
e. 2

Let X and Y be vectors in $\mathbb{R}^n$. Which of the following statement are true?

(i) If $\{X + Y, X - Y\}$ is an orthogonal set then $X = Y$

(ii) If $\{X + Y, X - Y\}$ is an orthogonal set then $X = -Y$

(iii) If $\{X + Y, X - Y\}$ is an orthogonal set then $\|X\| = \|Y\|$

Find the dimension of the column space of

$$\begin{bmatrix} -1 & 7 & 0 & 3 & 1 \\ 1 & -1 & 0 & -1 & -1 \\ 0 & -3 & 0 & -1 & -1 \\ 0 & 5 & 3 & 4 & -3 \end{bmatrix}$$