You can preview this quiz, but if this were a real attempt, you would be blocked because:

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Question **1**

Not yet answeredMarked out of 20

Let A, B, C, D be points in 3-space with position vectors **a**, **b**, **c**, **d** respectively such that $\mathbf{b} - \mathbf{a} = 2(\mathbf{c} - \mathbf{d})$. Assume that the points A, B, C, D are distinct and do not all lie on the same line.

Let E be the point on the line passing through C and D such that the vectors represented by $\overrightarrow{BE}$ and $\overrightarrow{EC}$ are orthogonal to each other. Let **e** be the position vector of E.

$\frac{\mathbf{b}+2\mathbf{d}}{3}$ is	Choose...
The vectors represented by $\overrightarrow{BE}$ and $\overrightarrow{DE}$ are	Choose...
$\mathbf{e} \times (\mathbf{b} \cdot \mathbf{c})$ is	Choose...
$\mathbf{r} = \mathbf{a} + \lambda(\mathbf{c} - \mathbf{d})$ is	Choose...
$(\mathbf{b} - \mathbf{a}) \times (\mathbf{d} - \mathbf{e})$ is	Choose...
$(\mathbf{b} - \mathbf{a}) \cdot (\mathbf{c} - \mathbf{d})$ is	Choose...
The vectors represented by $\overrightarrow{AB}$ and $\overrightarrow{DC}$ are	Choose...
$(\mathbf{b} - \mathbf{e}) \cdot (\mathbf{d} - \mathbf{c})$ is	Choose...
$\frac{\mathbf{a}+\mathbf{b}}{2}$ is	Choose...
$(\mathbf{r} - \mathbf{c}) \cdot (\mathbf{b} - \mathbf{e}) = 0$ is	Choose...

Question **2**

Not yet answeredMarked out of 6

Let A be the point with coordinates (-3, 0, -2) and let B be the point with coordinates (2, 0, 0). Let l be the line passing through the origin and B. Let D be the midpoint of AB.

What is the distance from D to the line l?

[Please enter your answer numerically in decimal format. You will be marked correct as long as what you enter is within 0.25 of the correct answer. So for example, if the correct answer is 6.78 then any input that lies between between 6.53 and 7.03 will be marked as correct.]

Answer:

Question **3**

Not yet answeredMarked out of 6

Let A be the point with coordinates (7, 5, -1) and let B be the point with coordinates (6, 5, 0). Let Π be a plane that passes through the points O,A,B where O denotes the origin.

What is the distance of the point with coordinates (2, -1, -2) from Π?

[Please enter your answer numerically in decimal format. You will be marked correct as long as what you enter is within 0.25 of the correct answer. So for example, if the correct answer is 6.78 then any input that lies between between 6.53 and 7.03 will be marked as correct.]

Answer:

Question **4**

Not yet answeredMarked out of 6

Let l_1 be the line described by the Cartesian equations

- x = 1
- y-8 = 2(z-7)

Let l_2 be the line described by the Cartesian equations

- x = 4
- y-8 = z-7

Compute the distance between l_1 and l_2.

[Please enter your answer numerically in decimal format. You will be marked correct as long as what you enter is within 0.25 of the correct answer. So for example, if the correct answer is 6.78 then any input that lies between between 6.53 and 7.03 will be marked as correct.]

Answer:

Question **5**

Not yet answered Marked out of 5

Let Π_1 be the plane with Cartesian equation z=0. Let Π_2 be the plane with Cartesian equation x=0. Let Π_3 be the plane with Cartesian equation y=0. Let Π_4 be the plane with Cartesian equation 5x + 3y + 3z = 9 .

Let P = (p_1, p_2, p_3) be a point on the plane Π_4 such that $p_1 > 0, p_2 > 0, p_3 > 0$ and P has equal distance from Π_1, Π_2 and Π_3. Write down the value of p_1.

[So, for example, if you find that P has coordinates (2.5, 3.2, 8.7) then you should enter 2.5 as your answer. Please enter your answer numerically in decimal format. You will be marked correct as long as what you enter is within 0.25 of the correct answer.]

Answer:

Question **6**

Not yet answered Marked out of 3

The geometric object in 3-space represented by the equation

(x + y +z)^2 = 324

is

- a. a union of two planes, both of which pass through (6, 6, 6)
- b. a union of two planes, one of which passes through (6, 6, 6) and the other passes through (-6, -6, -6)
- c. the line x=y=z, which is the intersection of two planes
- d. a plane passing through the point (6, 6, 6)
- e. the empty set
- f. the point (-6, -6, -6)

Question **7**

Not yet answered Marked out of 4

Select **all** the real numbers M among the choices below such that the two planes given by

$$\mathbf{r} \cdot \begin{pmatrix} -2 \\ 1 \\ -2 \end{pmatrix} = 1$$

and

$$\mathbf{r} \cdot \begin{pmatrix} -4 \\ 2 \\ -4 \end{pmatrix} = M$$

do **not** intersect.

[Note: In this question, you can select more than one correct answer]

- a. M equals -13
- b. M equals 1
- c. M equals 2

Question **8**

Not yet answeredMarked out of 20

Consider the following three matrices

$$A = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix} \quad B = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{pmatrix} \quad C = \begin{pmatrix} 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$

Matrix C is in RREF

○True ○False

C is an elementary matrix

○True ○False

Matrix B is invertible

○True ○False

B is an elementary matrix

○True ○False

$A^{-1} = A$

○True ○False

Matrix B is in REF

○True ○False

Matrix B is not in RREF

○True ○False

A is an elementary matrix

○True ○False

Matrix A is in REF

○True ○False

Matrix product BC is a 5×3 matrix not in REF

○True ○False

Question **9**

Not yet answered Marked out of 5

Consider the linear system

$$\begin{array}{ccccccc} x_1 & -x_2 & +x_3 & +x_4 & = & 3 \\ -2x_1 & +x_2 & -2x_3 & & = & -7 \\ 3x_1 & -2x_2 & +3x_3 & +x_4 & = & 10 \end{array}$$

Bring the augmented matrix of the system to row echelon form, and state which of the variables are leading variables and which are free variables.

Select one:

- a. x_1, x_2 and x_3 are the leading variables, while x_4 is the free variable
- b. x_1 and x_4 are the leading variables, while x_2 and x_3 are the free variables
- c. x_1 and x_3 are the leading variables, while x_2 and x_4 are the free variables
- d. x_1 and x_2 are the leading variables, while x_3 and x_4 are the free variables
- e. x_1, x_2 and x_4 are the leading variables, while x_3 is the free variable

Question **10**

Not yet answered Marked out of 5

Consider the following two matrices

$$A = \left(\begin{array}{cccc|c} 1 & 2 & 1 & 1 & 2 \\ 0 & 1 & 0 & -2 & 1 \\ 0 & 1 & 0 & 0 & 0 \end{array}\right) \qquad B = \begin{pmatrix} 1 & 2 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Select one:

- a. both A and B are in reduced row echelon form
- b. A is a 3 x 3 matrix
- c. none of the others
- d. both A and B are in row echelon form
- e. A is in reduced row echelon form and B is in row echelon form

Question **11**

Not yet answered Marked out of 5

Consider the system of linear equations:

$$\begin{aligned} x_1 + kx_2 &= 1 \\ 2x_1 + 4x_2 &= k \\ 4x_1 + 8x_2 &= 4 \end{aligned}$$

where $k \in \mathbb{R}$ is a parameter. Find the value of k for which the system is consistent.

[Please enter your answer numerically in decimal format. You will be marked correct as long as what you enter is within 0.25 of the correct answer. So for example, if the correct answer is 6.78 then any input that lies between between 6.53 and 7.03 will be marked as correct.]

Answer:

Question **12**

Not yet answered Marked out of 5

Using the matrix notation, write the system of linear equations:

$$\begin{aligned} 2x_1 - x_4 &= -1 \\ 5x_1 + x_2 &= -2 \\ x_3 &= 1 \\ -x_1 + 5x_3 + x_4 &= 0 \end{aligned}$$

as $A\mathbf{x} = \mathbf{b}$, where $\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix}$ is the vector of variables. Then, find the system solution as: $\mathbf{x} = A^{-1}\mathbf{b}$, and write the value of x_2.

(Hint: Use the Gauss-Jordan algorithm to find the inverse A^{-1} of the matrix A first).

[Please enter your answer numerically in decimal format. You will be marked correct as long as what you enter is within 0.25 of the correct answer. So for example, if the correct answer is 6.78 then any input that lies between between 6.53 and 7.03 will be marked as correct.]

Answer:

Question **13**

Not yet answered Marked out of 5

Solve the following system using the Gaussian algorithm:

$$\begin{aligned} 2x_1 - x_2 + 3x_3 &= 1 \\ -2x_1 + x_2 - x_3 &= -1 \\ x_1 - 3x_2 + 6x_3 &= 3 \end{aligned}$$

Let $\mathbf{x}$ be the vector $\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \\ x_3 \end{pmatrix}$, where $x_1,\ x_2$ and x_3 are solutions of the system, and $\mathbf{y}$ be the vector $\mathbf{y} = \begin{pmatrix} -2 \\ 1 \\ 0 \end{pmatrix}$. Evaluate the scalar product of $\mathbf{x}$ and $\mathbf{y}$.

[Please enter your answer numerically in decimal format. You will be marked correct as long as what you enter is within 0.25 of the correct answer. So for example, if the correct answer is 6.78 then any input that lies between between 6.53 and 7.03 will be marked as correct.]

Answer:

Question **14**

Not yet answered Marked out of 5

Consider the matrix $A = \begin{pmatrix} -1 & 1 & 0 \\ 0 & 2 & -1 \\ -1 & 0 & -1 \end{pmatrix}$ and vectors $\mathbf{x} = \begin{pmatrix} 0 \\ 1 \\ 2 \end{pmatrix}$ and $\mathbf{y} = \begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$.

Let vector $\mathbf{v}$ be defined as $\mathbf{v} = (A - A^T)\mathbf{y}$. Evaluate the scalar product $\mathbf{x} \cdot \mathbf{v}$.

[Please enter your answer numerically in decimal format. You will be marked correct as long as what you enter is within 0.25 of the correct answer. So for example, if the correct answer is 6.78 then any input that lies between between 6.53 and 7.03 will be marked as correct.]

Answer:

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