Question 1

Simple Familiar
Technology Free
2021

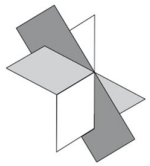
QUESTION 5

The augmented matrix shown is produced when a Gaussian elimination technique is used to solve a certain system of equations with three variables.

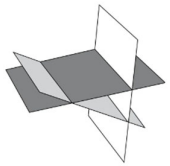
$$\left[\begin{array}{ccc|c} 1 & 1 & -3 & 4 \\ 0 & -1 & 5 & -6 \\ 0 & 0 & 1 & 0 \end{array}\right]$$

The geometric interpretation of the solution to this system of equations is best represented by

(A)

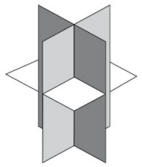


(B)



(C)

(D)



Question 2

Simple Familiar
Technology Free
2020

QUESTION 2

When using proof by mathematical induction to show that $n(2n-1)(2n+1)$ is divisible by $3 \forall n \in Z^+$, the inductive step requires proving

(A) $(k+1)(2k)(2k+2)$ is divisible by 3.

(B) $(k+1)(2k)(2k+3)$ is divisible by 3.

(C) $(k+1)(2k+1)(2k+2)$ is divisible by 3.

(D) $(k+1)(2k+1)(2k+3)$ is divisible by 3.

Question 3

Simple Familiar
Technology Free
2022

QUESTION 10

A plane is represented by the equation $x-2z=5$. A vector normal to this plane is

(A) $\begin{pmatrix} 1 \\ -2 \\ 5 \end{pmatrix}$

(B) $\begin{pmatrix} 1 \\ 0 \\ 2 \end{pmatrix}$

(C) $\begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix}$

(D) $\begin{pmatrix} 1 \\ -2 \\ -5 \end{pmatrix}$

Question 4

Simple Familiar
Technology Free
2021

QUESTION 12 (8 marks)

Consider the plane $x-y-2z=15$.

a) Determine a vector $\boldsymbol{n}$ that is perpendicular to the plane. *[1 mark]*

b) Determine the vector equation of the line l that is perpendicular to the plane and contains the point $A(-2,1,3)$. *[1 mark]*

c) Use the result from Question 12b) to express the equation of the line l in parametric form. *[1 mark]*

The line l and the plane intersect at point S.

d) Show that the coordinates of S are $(2,-3,-5)$. *[3 marks]*

e) Determine $\overrightarrow{AS}$. *[1 mark]*

f) Use a property of parallel vectors to verify that $\overrightarrow{AS}$ and $\boldsymbol{n}$ are parallel. *[1 mark]*

Question 5

Complex Familiar
Technology Free
2022

QUESTION 16 (7 marks)

Consider this system of equations that corresponds to three planes.

$$x+5y=1+2z$$
$$x+z=3y+3$$
$$8y-\lambda=3z$$

a) Use a Gaussian technique to determine the value of λ for which this system of equations has infinitely many solutions. *[4 marks]*

b) Use the result from Question 16a) to determine the infinitely many solutions. Express your answer in the form of a vector equation of a line. *[3 marks]*