19S1 Mathematics 1,
MSE DEEPAN PANDA, 9/10/19 at 2:56:22 PM SGT

Question1: *Score 1/1*

Let $\mathbf{u} = \begin{pmatrix} 1 \\ 1 \\ -1 \end{pmatrix}$ and $\mathbf{v} = \begin{pmatrix} 1 \\ -2 \\ 1 \end{pmatrix}$. Find

(a) the magnitude of $\mathbf{u}$, express your answer up to 2 decimal places.

Answer :

Your response	Correct response
1.73	

Grade: 1/1.0

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(b) the dot product of $\mathbf{u}$ and $\mathbf{v}$.

Answer :

Your response	Correct response
-2	

Grade: 1/1.0

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(c) the angle between $\mathbf{u}$ and $\mathbf{v}$, give your answer in radians, up to 2 decimal places.

Answer :

Your response	Correct response
2.06	

Grade: 1/1.0

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Total grade: 1.0×1/3 + 1.0×1/3 + 1.0×1/3 = 33% + 33% + 33%

Question2: *Score 1/1*

Let $\mathbf{a}$, $\mathbf{b}$ and $\mathbf{c}$ be unit vectors such that $\mathbf{a} \cdot \mathbf{b} = 1/3$, $\mathbf{b} \cdot \mathbf{c} = 1/7$ and $\mathbf{a} \cdot \mathbf{c} = 1/8$. Evaluate (write in the exact form)

- $||7\mathbf{a}||$ =

Your response	Correct response
7	

Grade: 1/1.0

- $3\mathbf{a} \cdot 7\mathbf{b} =$

Your response	Correct response
7	

Grade: 1/1.0

- $\mathbf{a} \cdot (\mathbf{b} - \mathbf{c}) =$

Your response	Correct response
$\frac{5}{24}$	

Grade: 1/1.0

- $(\mathbf{a} + \mathbf{b} + \mathbf{c}) \cdot (\mathbf{a} - \mathbf{b}) =$

Your response	Correct response
$-\frac{1}{56}$	

Grade: 1/1.0

Total grade: 1.0×1/4 + 1.0×1/4 + 1.0×1/4 + 1.0×1/4 = 25% + 25% + 25% + 25%

Question3: *Score 1/1*

If $||\mathbf{u}|| = 2$, $||\mathbf{v}|| = 3$ and $\mathbf{u} \cdot \mathbf{v} = 3$, find $||\mathbf{u} + \mathbf{v}||$, express your answer up to 2 decimal places.

Answer :

Your response	Correct response
4.36	

Grade: 1/1.0

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Total grade: 1.0×1/1 = 100%

Question4: *Score 1/1*

Let $\mathbf{u}$ and $\mathbf{v}$ be vectors where $||\mathbf{u}+\mathbf{v}|| = 2$ and $||\mathbf{u}-\mathbf{v}|| = 9$. Find $\mathbf{u}\cdot\mathbf{v}$.

Answer :

Your response	Correct response
$-\frac{77}{4}$	

Grade: 1/1.0

Total grade: 1.0×1/1 = 100%

Question5: *Score 1/1*

Consider two vectors $\mathbf{a} = -3i - j$ and $\mathbf{b} = 3i + j + k$. If $\mathbf{c} = xi + yj + kz, x > 0$ is the unit vector that is perpendicular to both a and b, find x, y and z.

Answer :

$x =$

Your response	Correct response
$\frac{1}{\sqrt{10}}$	

Grade: 1/1.0

$y =$

Your response	Correct response
$-\frac{3}{\sqrt{10}}$	

Grade: 1/1.0

$z =$

Your response	Correct response
0	

Grade: 1/1.0

Total grade: 1.0×1/3 + 1.0×1/3 + 1.0×1/3 = 33% + 33% + 33%

Question6: *Score 1/1*

Find the distance D from the point $S(4,3,3)$ to the line $\ell : \mathbf{r} = (0,1,2) + t(1,0,1), t \in \mathbb{R}$. Give your answer in 2 decimal places.

Answer : $D =$

Your response	Correct response
2.92	

Grade: 1/1.0

Total grade: 1.0×1/1 = 100%

Question7: *Score 1/1*

Consider the line $\ell : \mathbf{r}(t) = (2,8,2) + t(8,4,4), t \in \mathbb{R}$. Let $P(x,y,z)$ be the point on the line ℓ that is nearest to the origin. Find x, y and z. Express your solution in **exact** form.

Answer :

$x =$

Your response	Correct response
$-\frac{8}{3}$	

Grade: 1/1.0

$y =$

Your response	Correct response
$\frac{17}{3}$	

Grade: 1/1.0

$z =$

Your response	Correct response
$-\frac{1}{3}$	

Grade: 1/1.0

Total grade: 1.0×1/3 + 1.0×1/3 + 1.0×1/3 = 33% + 33% + 33%

Question8: *Score 1/1*

Find the shortest distance d from the origin to the plane $3x + 2y + 2z = 1$. Give your answer in 2 decimal places.

Answer : $d =$

Your response	Correct response
0.24	

Grade: 1/1.0

Total grade: 1.0×1/1 = 100%

Question9: *Score 1/1*

Find the **acute** angle θ (in radian) between the two planes $2x + 2y + 2z = 1$ and $5x + 5y - 4z = 2$. Give your answer in 2 decimal places.

Answer : $\theta =$

Your response	Correct response
1.13	

Grade: 1/1.0

Total grade: 1.0×1/1 = 100%

Question10: *Score 1/1*

Suppose the plane $x + ay + bz = c$ contains the point $(1, 2, 3)$ and the line $\ell : \mathbf{r}(t) = (4, 8, 7) + t(1, 1, 1), t \in \mathbb{R}$. Find a, b and c.

Answer :

$a =$

Your response	Correct response
0.5	

Grade: 1/1.0

$b =$

Your response	Correct response
$-\frac{3}{2}$	

Grade: 1/1.0

$c =$

Your response	Correct response
$-\frac{5}{2}$	

Grade: 1/1.0

Total grade: 1.0×1/3 + 1.0×1/3 + 1.0×1/3 = 33% + 33% + 33%

Question11: *Score 1/1*

Consider two planes $\pi_1 : x + y + z = 16$ and $\pi_2 : 5x + 8y + 10z = 18$. Suppose the plane $x + ay + bz = c$ is perpendicular to both π_1 and π_2 and contains the point $(5, 6, 4)$. Find a, b and c.

Answer :

$a =$

Your response	Correct response
-2.5	

Grade: 1/1.0

$b =$

Your response	Correct response
1.5	

Grade: 1/1.0

$c =$

Your response	Correct response
-4	

Grade: 1/1.0

Total grade: 1.0×1/3 + 1.0×1/3 + 1.0×1/3 = 33% + 33% + 33%

Question12: *Score 1/1*

Consider two planes

$$7x + 8y + 3z = 0,$$
$$7x + 8y + 3z = d$$

Suppose the distance in between the two planes is 14 and $d > 0$.

Find d. Express your answer up to 2 decimal points.

Answer : $d =$

Your response	Correct response
154.64	

Grade: 1/1.0

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Total grade: 1.0×1/1 = 100%

Question13: *Score 1/1*

Four points A, B, C and D forms a parallelogram with adjacent sides AB and AC and vertices $A(2, 0, 0)$. $B(0, 4, 0)$ and $C(0, 0, 3)$. Find the coordinates of D.

Answer : $D =($

Your response	Correct response
-2	

Grade: 1/1.0

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Your response	Correct response
4	

Grade: 1/1.0

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Your response	Correct response
3	

Grade: 1/1.0

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Total grade: 1.0×1/3 + 1.0×1/3 + 1.0×1/3 = 33% + 33% + 33%

Question14: *Score 1/1*

Four points A, B, C and D forms a parallelogram with adjacent sides AB and AC and vertices $A(6,0,0)$, $B(0,9,0)$ and $C(0,0,4)$. Find the area of the parallelogram, express your answer up to 2 decimal places.

Answer : The area of the parallelogram =

Your response	Correct response
69.20	

Grade: 1/1.0

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Total grade: 1.0×1/1 = 100%

Question15: *Score 1/1*

Consider four distinct points $A(0,0,0), B(2,6,0), C(0,-4,5)$ and $D(3,-5,7)$, where AB, AC and AD are three edges of a parallelepiped. Find the volume of the parallelepiped.

Answer : The volume of the parallelepiped =

Your response	Correct response
84	

Grade: 1/1.0

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Total grade: 1.0×1/1 = 100%