MATHS

BOOKS - TELUGU ACADEMY MATHS (TELUGU ENGLISH)

PRODUCT OF VECTORS

1 D Vsaq

1. If $\bar{a} = 2\bar{i} + \bar{j} - 3\bar{k}, \bar{b} = 3\bar{j} - 2\bar{j} - \bar{k}$ then find the angle between .

2. Find the angle between the vectors $\bar{i} + 2\bar{j} + 3\bar{k} \text{ and } 3\bar{i} - \bar{j} + 2\bar{k}.$

3. If $\bar{a} = \bar{i} + 2\bar{j} - 3\bar{k}, \bar{b} = 3\bar{i} - \bar{j} + 2\bar{k}$ then S.T $\bar{a} + \bar{b}, \bar{a} - \bar{b}$ are perpendicular.

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4. If vectors $\lambda\bar{i} - 3\bar{j} + 5\bar{k}, 2\lambda\bar{i} - \lambda\bar{j} - \bar{k}$ are perpendicular to each other find λ.

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5. If the vectors $2\bar{i} + \lambda\bar{j} - \bar{k}$ and $4\bar{i} - 2\bar{j} + 2\bar{k}$ are perpendicular to each other than find λ.

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6. For what values of λ the vectors $\bar{i} - \lambda\bar{j} + 2\bar{k}, 8\bar{i} + 6\bar{j} - \bar{k}$ are at right angles.

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7. If $|\bar{a}+\bar{b}| = |\bar{a}-\bar{b}|$ then find the angle between $\bar{a}$ and $\bar{b}$.

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8. If $\bar{a} = \bar{i} - \bar{j} - \bar{k}, \bar{b} = 2\bar{i} - 3\bar{j} + \bar{k}$ then find the projection vector of $\bar{b}$ on $\bar{a}$ and its magnitude.

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9. If $\bar{a} = \bar{i} + \bar{j} + \bar{k}, \bar{b} = 2\bar{i} + 3\bar{j} + \bar{k}$ then find the projection vector of $\bar{b}$ on $\bar{a}$ and its magnitude.

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10. If $\bar{a} = \bar{i} + \bar{j} + \bar{k}, \bar{b} = 2\bar{i} + 3\bar{j} + \bar{k}$ then find the projection vector of $\bar{b}$ on $\bar{a}$ and its magnitude.

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11. Find the Cartesian equation of the plane passing through the point $(-2, 1, 3)$ and perpendicular to the vector $3\bar{i} + \bar{j} + 5\bar{k}$.

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12. Find the cartesian equation of the plane through the point $A(2, -1, -4)$ and parallel to the plane $4x - 12y - 3z - 7 = 0$.

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13. Find the angle between the planes $2x - 3y - 6z = 5$ and $6x + 2y - 9z = 4$

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14. Find anle between planes

$\bar{r}.\left(2\bar{i}-\bar{j}+2\bar{k}\right)=3, \bar{r}.\left(3\bar{i}+6\bar{j}+\bar{k}\right)=4$

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15. If $\bar{a}=2\bar{i}-\bar{j}+\bar{k}, \text{ and } \bar{b}=\bar{i}-3\bar{j}-5\bar{k}$ then find $\left|\bar{a}\times\bar{b}\right|$.

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16. Find a unit vector perpendicular to the plane containing the vector

$\bar{a}=4\bar{i}+3\bar{j}-\bar{k}, \bar{b}=2\bar{i}-6\bar{j}-3\bar{k}$

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17. Find unit vector perpendicular to both $\bar{i}+\bar{j}+\bar{k} \text{ and } 2\bar{i}+\bar{j}+3\bar{k}$.

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18. If $\bar{a} = 2\bar{i} - 3\bar{j} + 5\bar{k}, \bar{b} = -\bar{i} + 4\bar{j} + 2\bar{k}$ then find $\bar{a} \times \bar{b}$ and unit vector perpendicular to both $\bar{a}, \bar{b}\left[-26\bar{i} - 9\bar{j} + 5\bar{k}, \pm \frac{1}{\sqrt{782}}26\bar{i} + 9\bar{j} - 5\bar{k}\right)$.

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19. If $4\bar{i} + \frac{2p}{3}\bar{j} + p\bar{k}$ is parallel to the vector $\bar{i} + 2\bar{j} + 3\bar{k}$, find p.

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20. Let $\bar{a} = 2\bar{i} - \bar{j} + \bar{k}, \bar{b} = 3\bar{i} + 4\bar{j} - \bar{k}$ and if θ is the angle between $\bar{a}, \bar{b}$ then find $\sin\theta$.

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21. If θ is the angle between the vectors $\bar{i}+\bar{j}, \bar{j}+\bar{k}$ then find $\sin\theta$.

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22. Find the area of the triangle having $(3\bar{i}+4\bar{j}), (-5\bar{i}+7\bar{j})$ as adjacent sides.

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23. If $\bar{a}=\bar{i}+2\bar{j}+3\bar{k}, \bar{b}=3\bar{i}+5\bar{j}-\bar{k}$ are 2 sides of a triangle, find its area.

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24. Find the area of the parallelogram whose adjacent sides are $\bar{a}=2\bar{j}-\bar{k}, \bar{b}=-\bar{i}+\bar{k}$.

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25. Find the area of the parallelgram whose adjacent sides are $\bar{a} = 2\bar{i} - 3\bar{j}, \bar{b} = 3\bar{i} - \bar{k}$

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26. Find the vector area and area of the parallelogram having $\bar{a} = \bar{i} + 2\bar{j} - \bar{k}, \bar{b} = 2\bar{i} - \bar{j} + 2\bar{k}$ as adjacent sides.

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27. Find the area of the parallelogram whose diagonals are $3\bar{i} + \bar{j} - 2\bar{k}, \bar{i} - 3\bar{j} + 4\bar{k}$

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28. Find the volume of the parallelopiped having co-terminus edges $\bar{i}+\bar{j}+\bar{k}, \bar{i}-\bar{j}, \bar{i}+2\bar{j}-\bar{k}.$

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29. Find the volume of the parallelopiped having co-tenninus edges are represented by the vectors $2\bar{i}-3\bar{j}+\bar{k}, \bar{i}-\bar{j}+2\bar{k}, 2\bar{i}+\bar{j}-\bar{k}.$

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30. Find the volume of the tetrahedron having the edges

$,\bar{i}+\bar{j}+\bar{k}, \bar{i}-\bar{j}, \bar{i}+2\bar{j}+\bar{k}.$

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31. Find the volume of the tetrahedron, whose vertices are $(1, 2, 1), (3, 2, 5), (2, -1, 0), (-1, 0, 1).$

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32. Prove that the vectors $\bar{a} = 2\bar{i} - \bar{j} + \bar{k}, \bar{b} = \bar{i} - 3\bar{j} - 5\bar{k}$ and $\bar{c} = 3\bar{i} - 4\bar{j} - 4\bar{k}$ are coplanar.

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33. If the vectors $\bar{a} = 2\bar{i} - \bar{j} + \bar{k}, \bar{b} = \bar{i} + 2\bar{j} - 3\bar{k}, \bar{c} = 3\bar{i} + p\bar{j} + 5\bar{k}$ are coplanar then find p.

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34. Find t, for which the vectors $2\bar{i} - 3\bar{j} + \bar{k}, \bar{i} + 2\bar{j} - 3\bar{k}, \bar{j} - t\bar{k}$ are coplanar.

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1 D Saq

1. If $\bar{a}, \bar{b}, \bar{c}$ are non-coplaner, then show that the vectors $\bar{a} - \bar{b}, \bar{b} + \bar{c}, \bar{c} + \bar{a}$ are coplanar

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2. It a,b and c are non-coplanar vectors and the four points with position vectors $2a + 3b - c, a - 2b + 3c, 3a + 4b + 2c$ and $ka - 6b + 6c$ are coplanar, then k=

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3. $\bar{a}, \bar{b}, \bar{c}$ are coplanar vectors . Prove that of the following four points are coplanar. $6\bar{a} + 2\bar{b} - \bar{c}, 2\bar{a} - \bar{b} + 3\bar{c}, \ - \bar{a} + 2\bar{b} - 4\bar{c}, \ - 12\bar{a} - \bar{b} - 3\bar{c}.$

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4. Prove that the four points $4\bar{i} + 5\bar{j} + \bar{k}, \ -(\bar{j} + \bar{k}), 3\bar{i} + 9\bar{j} + 4\bar{k}, \ -4\bar{i} + 4\bar{j} + 4\bar{k}$ are coplanar.

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5. Find the area of the triangle formed with the points $A(1, 2, 3), B(2, 3, 1), C(3, 1, 2)$.

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6. Find the unit vector perpendicular to the plane passing through the points $(1, 2, 3), (2, -1, 1)$ and $(1, 2, -4)$.

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7. Find the vector having magnitude $\sqrt{6}$ units and perpendicular to both $2\bar{i} - \bar{k}, 3\bar{j} - \bar{i} - \bar{k}$.

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8. Find a vector of magnitude 3 and perpendicular to both the vectors $\bar{b}-2\bar{i}-2\bar{j}+\bar{k}, \bar{c}=2\bar{i}+2\bar{j}+3\bar{k}.$

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9. If $\bar{a}+\bar{b}+\bar{c}=\bar{0}$ then prove that $\bar{a}\times\bar{b}=\bar{b}\times\bar{c}=\bar{c}\times\bar{a}.$

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10. For any vector $\bar{a}$, show that $|\bar{a}\times\bar{j}|^2+|\bar{a}\times\bar{k}|^2=2|\bar{a}|^2.$

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11. If $\bar{a}=2\bar{i}+\bar{j}-\bar{k}, \bar{b}=-\bar{i}+2\bar{j}-4\bar{k}, \bar{c}=\bar{i}+\bar{j}+\bar{k}$ then find $(\bar{a}\times\bar{b}).(\bar{b}\times\bar{c})$

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1 D Laq

1. P.T the smaller angle θ between any two diagonals of a cube is given by $\cos\theta = 1/3$

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2. If $\bar{a}, \bar{b}, \bar{c}$ are any three vectors then $(\bar{a}\times\bar{b})\times\bar{c}$ is a vector

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3. If $\bar{a} = \bar{i} - 2\bar{j} - 3\bar{k}, \bar{b} = 2\bar{i} + \bar{j} - \bar{k}, \bar{c} = \bar{i} + 3\bar{j} - 2\bar{k}$ then verify that $\bar{a}\times(\bar{b}\times\bar{c}) = (\bar{a}.\bar{c})\bar{b} - (\bar{a}.\bar{b})\bar{c}.$

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4. If

$\bar{a} = \bar{i} - 2\bar{j} + 3\bar{k}, \bar{b} = 2\bar{i} + \bar{j} + \bar{k}, \bar{c} = \bar{i} + \bar{j} + 2\bar{k}$ then find $\left| (\bar{a} \times \bar{b}) \times \bar{c} \right|$

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5. If $\bar{a} = \bar{i} - 2\bar{j} + \bar{k}, \bar{b} = 2\bar{i} + \bar{j} + \bar{k}, \bar{c} = \bar{i} + 2\bar{j} - \bar{k},$ then find $\bar{a} \times (\bar{b} \times \bar{c})$ and $\left| (\bar{a} \times \bar{b}) \times \bar{c} \right|$.

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6. If $\bar{a} = \bar{i} - 2\bar{j} - 3\bar{k}, \bar{b} = 2\bar{i} + \bar{j} - \bar{k}, \bar{c} = \bar{i} + 3\bar{j} - 2\bar{k},$ find $\bar{a} \times (\bar{b} \times \bar{c})$.

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7. If

$\bar{a} = 2\bar{i} + \bar{j} - 3\bar{k}, \bar{b} = \bar{i} - 2\bar{j} + \bar{k}, \bar{c} = -\bar{i} + \bar{j} - 4\bar{k}$ and $\bar{d} = \bar{i} + \bar{j} + \bar{k}$

, then compute $\left| (\bar{a} \times \bar{b}) \times (\bar{c} \times \bar{d}) \right|$.

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8. If $\bar{a} = 2\bar{i} + 3\bar{j} + 4\bar{k}, \bar{b} = \bar{i} + \bar{j} - \bar{k}, \bar{c} = \bar{i} - \bar{j} + \bar{k}$, compute $\bar{a}x(\bar{b}x\bar{c})$ and verify that it is perpendicular to $\bar{a}$.

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9. If $\bar{a} = \bar{i} - 2\bar{j} - 3\bar{k}, \bar{b} = 2\bar{i} + \bar{j} - \bar{k}, \bar{c} = \bar{i} + 3\bar{j} - 2\bar{k}$ then verify that $\bar{a} \times (\bar{b} \times \bar{c}) = (\bar{a}.\bar{c})\bar{b} - (\bar{a}.\bar{b})\bar{c}$.

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10. Find the shortest distance between the skew lines .

$\bar{r} = (6\bar{i} + 2\bar{j} + 2\bar{k}) + t(\bar{i} - 2\bar{j} + 2\bar{k})$ and $\bar{r} = (-4\bar{i} - \bar{k}) + s(3\bar{i} - 2\bar{j}$

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11. If

$A = (1, -2, -1), B = (4, 0, -3), C = (1, 2, -1), D = (2, -4, -5)$

then find distance between $\overline{AB}, \overline{CD}$

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12. By vector method prove that altitudes of a triangle are concurrent.

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13. The perpendicular bisectors of the sides of a triangle are concurrent.

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2 D Vsaq Saq Laq

1. $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}, \vec{b} = \hat{i} - 3\hat{j} - 5\hat{k}$. Find the vector $\vec{c}$ such that $\vec{a}, \vec{b}$ and $\vec{c}$ form the sides of a triangle.

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2. if $\bar{a} + \bar{b} + \bar{c} = \bar{0}, |\bar{a}| = 3, |\bar{b}| = 5, |\bar{c}| = 7$ then find angle between $\bar{a}, \bar{b}$.

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3. If $\bar{a} \times \bar{b} = \bar{b} \times \bar{c} \neq 0$, then show that $\bar{a} + \bar{c} = p\bar{b}$, where p is some scalar.

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4. If $\bar{a}, \bar{b}$ and $\bar{a} - \bar{b}$ are unit vectors, then what is the angle between $\bar{a}$ and $\bar{b}$?

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5. If $\bar{a}, \bar{b}$ are non-zero vectors such that $\left|\bar{a}+\bar{b}\right|^2 = |\bar{a}|^2 + \left|\bar{b}\right|^2$, then find the angle between $\bar{a}, \bar{b}$.

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6. If $4\bar{i} + \frac{2p}{3}\bar{j} + p\bar{k}$ is parallel to the vector $\bar{i} + 2\bar{j} + 3\bar{k}$, find p.

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7. If $|\bar{a}| = 2, \left|\bar{b}\right| = 3, |\bar{c}| = 4$ and each of $\bar{a}, \bar{b}, \bar{c}$ is perpendicular to the sum of the other two vectors, then find the magnitude of $\bar{a} + \bar{b} + \bar{c}$.

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8. $\bar{a}, \bar{b}, \bar{c}$ are pair wise non zero and non collinear vectors. If $\bar{a}+\bar{b}$ is collinear with $\bar{c}$ and $\bar{b}+\bar{c}$ is collinear with $\bar{a}$ then find vector $\bar{a}+\bar{b}+\bar{c}$.

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9. Find unit vector parallel to the XOY-plane and perpendicular to the vector $4\bar{i}-3\bar{j}+\bar{k}$.

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10. Find the equation of the plane through the point $(3, -2, 2)$ and perpendicular to the vector $(4, 7, -4)$.

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11. For any two vectors $\bar{a}, \bar{b}$ prove that $\left|\bar{a}\times\bar{b}\right|^2 = |\bar{a}|^2\left|\bar{b}\right|^2 - \left(\bar{a}.\,\bar{b}\right)^2$.

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12. For any three vectors $\bar{a}, \bar{b}, \bar{c}$ prove that $\left[\bar{b}+\bar{c}\bar{c}+\bar{a}\bar{a}+\bar{b}\right]=2\left[\bar{a}\bar{b}\bar{c}\right]$.

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13. If $\left(\bar{b}\times\bar{c}\right)\times\left(\bar{b}\times\bar{a}\right)=3\bar{c}$, then find $\left[\bar{b}\times\bar{c}\bar{c}\times\bar{a}\bar{a}\times\bar{b}\right]$.

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14. If $\bar{a}, \bar{b}, \bar{c}$ are mutually perpendicular unit vectors, then find $\left[\bar{a}\bar{b}\bar{c}\right]^2$.

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15. Show that $\left(\bar{a}+\bar{b}\right).\left[\left(\bar{b}+\bar{c}\right)\times\left(\bar{c}+\bar{a}\right)\right]=2\left[\bar{a}\bar{b}\bar{c}\right]$.

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16. Show that

i) $\bar{a} \times (\bar{a} \times (\bar{a} \times \bar{b})) = (\bar{a}.\bar{a})(\bar{b} \times \bar{a})$

ii) $\{(\bar{a} \times \bar{b}) \times (\bar{a} \times \bar{c})\}.\bar{d} = (\bar{a}.\bar{d})[\bar{a}\bar{b}\bar{c}]$

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17. If $\bar{a}, \bar{b}, \bar{c}, \bar{d}$ are any four vectors then $(\bar{a} \times \bar{b}) \times (\bar{c} \times \bar{d})$ is a vector

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18. Find the value of $[\bar{i} + \bar{j} + \bar{k}, \bar{i} - \bar{j}, \bar{i} + 2\bar{j} - \bar{k}]$.

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19. By vector method prove that the angle in a semi circle is a right angle.

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20. In a paralledogram, the sum of the square of the lengths of the diagonals is equal to sum of the squares of the lengths of its sides.

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21. The vectors AB = 3i - 2j + 2k and BC = - I - 2k are the adjacent sides of a parallelogram. The angle between its diagonals is

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22. Let $\bar{a}, \bar{b}$ and $\bar{c}$ be mutually orthogonal vectors of equal magnitudes. Prove that the vector $\bar{a}+\bar{b}+\bar{c}$ is equally inclined to each of $\bar{a}, \bar{b}$ and $\bar{c}$, the angle of inclination being $\cos^{-1}\frac{1}{\sqrt{3}}$

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23. Let $\bar{a}$ be perpendicular to both $\bar{b}, \bar{c}$. If $|\bar{a}| = 2, |\bar{b}| = 3, |\bar{c}| = 4$ and $(\bar{b}, \bar{c}) = \frac{2\pi}{3}$, compute $|[\bar{a}\bar{b}\bar{c}]|$.

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24. $\bar{a}, \bar{b}, \bar{c}$ are three unit vectors, $\bar{b}$ is not parallel to $\bar{c}$ and $\bar{a} \times (\bar{b} \times \bar{c}) = \frac{1}{2}\bar{b}$ then $(\bar{a}, \bar{b})$= .... , $(\bar{a}, \bar{c}) =$

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25. Let $\bar{a}$ and $\bar{b}$ be vectors, satisfying $|\bar{a}| = |\bar{b}| = 5$and $(\bar{a}, \bar{b}) = 45^\circ$. Find the area of the triangle having $\bar{a} - 2\bar{b}$and$3\bar{a} + 2\bar{b}$ as two of its sides.

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26. If $\bar{a}, \bar{b}$ and $\bar{c}$ represent the vertices A,B and C respectively of $\triangle ABC$, then prove that $|(\bar{a} \times \bar{b}) + (\bar{b} \times \bar{c}) + (\bar{c} \times \bar{a})|$ is twice the area of $\triangle ABC$.

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3 D Miscellaneous

1. Ig $|\bar{a}| = 11, |\bar{b}| = 23, |\bar{a} - \bar{b}| = 30$ then find the angle between the vectors $\bar{a}, \bar{b}$ and also find $|\bar{a} + \bar{b}|$.

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2. Let $\bar{a} = 2\bar{i} + 3\bar{j} + k, \bar{b} = 4\bar{i} + \bar{j}$ and $\bar{i} = \bar{i} - 3\bar{j} - \bar{k}$. Find vector $\bar{r}$ such t

.

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3. Show that the points $A(2\bar{i}-\bar{j}+\bar{k}), B(\bar{i}-3\bar{j}-5\bar{k}), C(3\bar{i}-4\bar{j}-4\bar{k})$ are the vertices of a right angled triangle.

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4. For any two vectors $\bar{a}$ and $\bar{b}$ show that

$|\bar{a}.\bar{b}| \leq |\bar{a}||\bar{b}|$ (Caucy- Schwartz inequality).

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5. For any two vectors $\bar{a}$ and $\bar{b}$ show that

$|\bar{a}+\bar{b}| \leq |\bar{a}|+|\bar{b}|$ (triangle inequality).

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6. The volume of the tetrahedron with $\bar{a}, \bar{b}, \bar{c}$ as co-terminus edges is $\frac{1}{6}\left|\left[\bar{a}\bar{b}\bar{c}\right]\right|$.

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7. If $\bar{a} = 2\bar{i} - 3\bar{j} + 5\bar{k}, \bar{b} = -\bar{i} + 4\bar{j} + 2\bar{k}$, then find $(\bar{a} + \bar{b}) \times (\bar{a} - \bar{b})$ and unit vector perpendicular to both $\bar{a} + \bar{b}$ and $\bar{a} - \bar{b}$

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8. If $\bar{a}\bar{b}\bar{c}$ and $\bar{d}$ are vectors such that $\bar{a} \times \bar{b} = \bar{c} \times \bar{d}$ and $\bar{a} \times \bar{c} = \bar{b} \times \bar{d}$. Then show that the vectors $\bar{a} - \bar{d}$ and $\bar{b} - \bar{c}$ are parallel.

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9. Let $\bar{a}, \bar{b}, \bar{c}$ be such that $\bar{c} \neq 0, \bar{a} \times \bar{b} = \bar{c}, \bar{b} \times \bar{c} = \bar{a}$. Show that $\bar{a}, \bar{d}, \bar{c}$ are pair orthogonal vectors and $|\bar{b}| = 1, |\bar{c}| = |\bar{a}|$.

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10. Let a = 2i + j - 2k and b = I + j. If c is vector such that ac = |c|, |c - a| = $2\sqrt{2}$ and the angle between $a \times b$ and c is 30°, then $|(a \times b) \times c|$ =

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11. Let $\bar{a}, \bar{b}$ be two non-collinear unit vectors, if $\overline{\alpha} = \bar{a} - (\bar{a}.\bar{b})\bar{b}$ and $\bar{\beta} = \bar{a} \times \bar{b},$ then show that $|\bar{\beta}| = |\overline{\alpha}|$.

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12. Let $\bar{a} = 4\bar{i} + 5\bar{j} - \bar{k}, \bar{b} - \bar{i} - 4\bar{j} + 5\bar{k}$ and $\bar{c} = 3\bar{i} + \bar{j} - \bar{k}$. Find the vector which is perpendicular to both $\bar{a}$ and $\bar{b}$ and $\overline{\alpha}.\bar{c} = 21$

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13. If $\bar{a}$ is a non-zero vector are two vectors such that $\bar{a} \times \bar{b} = \bar{a} \times \bar{c}$ and $\bar{a}.\,\bar{b} = \bar{a}.\,\bar{c}$, then prove that $\bar{b} = \bar{c}$.

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14. Find the equation of the plane passing through the point A=(2,3,-1),B=(4,5,2),C=(3,6,5).

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15. Find the distance of a point (2,5,-3) from the planer r.(6i-3j+2k)=4

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Spq

1. If $\bar{a} = \bar{i} + \bar{j} + \bar{k}, \bar{b} = 2\bar{i} + 3\bar{j} + \bar{k}$ then find the projection vector of $\bar{b}$ on $\bar{a}$ and its magnitude.

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2. Find unit vector perpendicular to both $\bar{i} + \bar{j} + \bar{k}$ and $2\bar{i} + \bar{j} + 3\bar{k}$.

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3. If $\bar{a} = 2\bar{i} - 3\bar{j} + 5\bar{k}, \bar{b} = -\bar{i} + 4\bar{j} + 2\bar{k}$ then find $\bar{a} \times \bar{b}$ and unit vector perpendicular to both $\bar{a}, \bar{b}\left[-26\bar{i} - 9\bar{j} + 5\bar{k}, \pm\frac{1}{\sqrt{782}}26\bar{i} + 9\bar{j} - 5\bar{k}\right)$.

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4. If θ is the angle between the vectors $\bar{i} + \bar{j}, \bar{j} + \bar{k}$ then find $\sin\theta$.

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5. If $\bar{a} = \bar{i} + 2\bar{j} + 3\bar{k}, \bar{b} = 3\bar{i} + 5\bar{j} - \bar{k}$ are 2 sides of a triangle, find its area.

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6. Find the area of the parallelgram whose adjacent sides are $\bar{a} = 2\bar{i} - 3\bar{j}, \bar{b} = 3\bar{i} - \bar{k}$

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7. Find the volume of the parallelopiped having co-tenninus edges are represented by the vectors $2\bar{i} - 3\bar{j} + \bar{k}, \bar{i} - \bar{j} + 2\bar{k}, 2\bar{i} + \bar{j} - \bar{k}.$

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8. Find the volume of the tetrahedron, whose vertices are (1,2,1),(3,2,5) , (2,-1,0) and (-1,0,1).

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9. Find t, for which the vectors $2\bar{i} - 3\bar{j} + \bar{k}, \bar{i} + 2\bar{j} - 3\bar{k}, \bar{j} - t\bar{k}$ are coplanar.

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10. $\bar{a}, \bar{b}, \bar{c}$ are coplanar vectors . Prove that of the following four points are coplanar.

$6\bar{a} + 2\bar{b} - \bar{c}, 2\bar{a} - \bar{b} + 3\bar{c}, -\bar{a} + 2\bar{b} - 4\bar{c}, -12\bar{a} - \bar{b} - 3\bar{c}.$

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11. Prove that the four points $4\bar{i} + 5\bar{j} + \bar{k}, -(\bar{j} + \bar{k}), 3\bar{i} + 9\bar{j} + 4\bar{k}, -4\bar{i} + 4\bar{j} + 4\bar{k}$ are coplanar.

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12. If $\bar{a}, \bar{b}, \bar{c}, \bar{d}$ are any four vectors then $(\bar{a} \times \bar{b}) \times (\bar{c} \times \bar{d})$ is a vector

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13. If $\bar{a} = \bar{i} - 2\bar{j} - 3\bar{k}, \bar{b} = 2\bar{i} + \bar{j} - \bar{k}, \bar{c} = \bar{i} + 3\bar{j} - 2\bar{k}$ then find $\bar{a} \times (\bar{b} \times \bar{c})$ and $|(\bar{b} \times \bar{c}) \times \bar{c}|$.

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14. If $\bar{a} = \bar{i} - 2\bar{j} - 3\bar{k}, \bar{b} = 2\bar{i} + \bar{j} - \bar{k}, \bar{c} = \bar{i} + 3\bar{j} - 2\bar{k}$ find $\bar{a} \times (\bar{b} \times \bar{c})$.

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15. If $\bar{a} = 2\bar{i} + \bar{j} - 3\bar{k}, \bar{b} = \bar{i} - 2\bar{j} + \bar{k}, \bar{c} = -\bar{i} + \bar{j} - 4\bar{k}$ and $\bar{d} = \bar{i} + \bar{j} + \bar{k}$, then compute $|(\bar{a} \times \bar{b}) \times (\bar{c} \times \bar{d})|$.

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