

NCERT/CBSE MATHEMATICS CLASS 12 textbook

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MISCELLANEOUS EXERCISES

Solutions to NCERT/CBSE MATH (Class XII) textbook

Chapter 10

VECTOR ALGEBRA

12. Let $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$. Find a vector \vec{d} which is perpendicular to both \vec{a} and \vec{b} , and $\vec{c} \cdot \vec{d} = 15$.

Solution:

Let the vector \vec{d} be $d_1\vec{i} + d_2\vec{j} + d_3\vec{k}$

We have the position vectors as:

$$\vec{a} = \vec{i} + 4\vec{j} + 2\vec{k}$$

$$\vec{b} = 3\vec{i} - 2\vec{j} + 7\vec{k}$$

$$\vec{c} = 2\vec{i} - \vec{j} + 4\vec{k}$$

Now:

Vector \vec{d} is perpendicular to \vec{a} and \vec{b} . Hence we have the equations:

$$\vec{d} \cdot \vec{a} = \vec{d} \cdot \vec{b} = 0$$

Hence :

$$d_1 + 4d_2 + 2d_3 = 0 \dots(1)$$

$$3d_1 - 2d_2 + 7d_3 = 0 \dots(2)$$

$$\therefore \vec{c} \cdot \vec{d} = 15$$

$$\Rightarrow 2d_1 - d_2 + 4d_3 = 0 \dots(3)$$

Solving the three equations using cramer's rule, we get:

$$\vec{d} = \frac{160}{3}\vec{i} - \frac{5}{3}\vec{j} - \frac{70}{3}\vec{k}$$

Please do not copy the answer given here

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