Answer on Question #52241 – Math – Vector Calculus

What are vectors that are not parallel to the same line, called?

scalar

collinear vectors

non-collinear vectors

vectors

Answer: non-collinear vectors.

7 Find the vector product axb. If a = 2i + 3j + 4k and b = 5i - 2j + k

11i + 18j - 19k

2j + 3k

5i - 6j + 7k

4i - 6j +11k

Solution

$$\vec{a}x\vec{b} = \begin{vmatrix} i & j & k \\ 2 & 3 & 4 \\ 5 & -2 & 1 \end{vmatrix} = i\big(3 \cdot 1 - 4(-2)\big) + j\big(4 \cdot 5 - 1(2)\big) + k\big(2 \cdot (-2) - 3(5)\big) = 11i + 18j - 19k.$$

Answer: 11i + 18j - 19k.

8 Find the scalar product a.b. If a = 2i + 3j + 4k and b = 5i - 2j + k

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Solution

$$\vec{a} \cdot \vec{b} = (2\mathrm{i} + 3\mathrm{j} + 4\mathrm{k})(5\mathrm{i} - 2\mathrm{j} + \mathrm{k}) = 2 \cdot 5 + 3 \cdot (-2) + 4 \cdot 1 = 8.$$

Answer: 8.

9 The centroid of a triangle of the triangle OAB is denoted by G. If o is the origin and line(OA) = 4i + 3j, line(OB) = 6i - j, find line(OG) in terms of the unit vectors I and j

10i - 3j

1/2(10i−2j)

10i + 2j

1/3(10i+2j)

Solution

Vector $\overline{OB} = \overline{OA} + \overline{AB}$, hence $\overline{AB} = \overline{OB} - \overline{OA}$, $\overline{AM} = \frac{1}{2}\,\overline{AB}$.

Vector $\overline{OM} = \overline{OA} + \overline{AM} = \overline{OA} + \frac{1}{2}\,\overline{AB} = \overline{OA} + \frac{1}{2}(\overline{OB} - \overline{OA}) = \frac{1}{2}(\overline{OB} + \overline{OA})$.

Let OM be the median of the triangle OAB. By properties of centroid, $OG = \frac{2}{3}OM$.

Thus,

$$\overline{OG} = \frac{2}{3}\overline{OM} = \frac{2}{3}\cdot\frac{1}{2}(\overline{OB} + \overline{OA}) = \frac{1}{3}(4i + 3j + 6i - j) = \frac{1}{3}(10i + 2j).$$

Answer: 1/3(10i+2j).

10 Given that a = 5i +2j - k and b = I - 3j + k. Find (a + b) x (a - b).

2i - 12j - 34k

2i + 12j + 34k

2i -3j + 12j

2i + 2k

Solution

$$\overrightarrow{(a\ +\ b)} = 5i\ + 2j\ -\ k + i -\ 3j\ +\ k = 6i - j.$$

$$\overrightarrow{(a -\ b)} = 5i\ + 2j\ -\ k - i +\ 3j -\ k = 4i + 5j - 2k.$$

$$\overrightarrow{(a\ +\ b)}x\overrightarrow{(a -\ b)} = \begin{vmatrix} i & j & k \\ 6 & -1 & 0 \\ 4 & 5 & -2 \end{vmatrix} = 2i + 12j + 34k.$$

Answer: 2i+12j+34k.