

Answer on Question #63504 – Math – Analytic Geometry

Question

6. If $A_1 = 3i - j - 4k$, $A_2 = -2i + 4j - 3k$, $A_3 = i + 2j - k$,

find $|3A_1 - 2A_2 + 4A_3|$.

Solution

$$\begin{aligned} 3A_1 - 2A_2 + 4A_3 &= 3(3i - j - 4k) - 2(-2i + 4j - 3k) + 4(i + 2j - k) = \\ &= 9i - 3j - 12k + 4i - 8j + 6k + 4i + 8j - 4k = 17i - 3j - 10k; \end{aligned}$$

$$|3A_1 - 2A_2 + 4A_3| = \sqrt{17^2 + (-3)^2 + (-10)^2} = \sqrt{398}.$$

Answer: $|3A_1 - 2A_2 + 4A_3| = \sqrt{398}$.

Question

7. Find a unit vector parallel to the resultant vector

$$A_1 = 2i + 4j - 5k ; A_2 = i + 2j + 3k$$

Solution

The resultant vector:

$$A_1 + A_2 = (2i + 4j - 5k) + (i + 2j + 3k) = 3i + 6j - 2k;$$

$$|A_1 + A_2| = \sqrt{3^2 + 6^2 + (-2)^2} = \sqrt{9 + 36 + 4} = 7.$$

Unit vector:

$$\frac{A_1 + A_2}{|A_1 + A_2|} = \frac{1}{7}(3i + 6j - 2k) = \frac{3}{7}i + \frac{6}{7}j - \frac{2}{7}k.$$

Answer: $\frac{3}{7}i + \frac{6}{7}j - \frac{2}{7}k$.

Question

8. Given the scalar defined by $\phi(x, y, z) = 3x^2z - xy^2 + 5$,

find ϕ at the point $(-1, -2, -3)$.

Solution

$$\phi(-1, -2, -3) = 3 \cdot (-1)^2 \cdot (-3) - (-1) \cdot (-2)^2 + 5 = -9 + 4 + 5 = 0.$$

Answer: $\phi(-1, -2, -3) = 0$.

Question

9. The following forces act on a particle P :

$$F_1 = 2i + 3j - 5k$$

$$F_2 = -5i + j + 3k$$

$$F_3 = i - 2j + 4k$$

$$F_4 = 4i - 3j - 2k$$

Find the magnitude of the resultant.

Solution

$$\begin{aligned} F_1 + F_2 + F_3 + F_4 &= (2i + 3j - 5k) + (-5i + j + 3k) + (i - 2j + 4k) + (4i - 3j - 2k) = \\ &= 2i - j \end{aligned}$$

$$|F_1 + F_2 + F_3 + F_4| = \sqrt{2^2 + (-1)^2} = \sqrt{5}.$$

Answer: $|F_1 + F_2 + F_3 + F_4| = \sqrt{5}$.

Question

10. If a and b are non-collinear vectors and

$$A = (x + y)a + (2x + y + 1)b$$

Solution

The statement of question is not complete