Question

7 Find a unit vector parallel to the resultant vector A1=2i+4j–5k, A2=i+2j+3k

Solution

The resultant vector is

$$\bar{A} = \overline{A_1} + \overline{A_2} = \left(2\bar{\imath} + 4\bar{\jmath} - 5\bar{k}\right) + \left(\bar{\imath} + 2\bar{\jmath} + 3\bar{k}\right) = (2 + 1)\bar{\imath} + (4 + 2)\bar{\jmath} + (-5 + 3)\bar{k} = 3\bar{\imath} + 6\bar{\jmath} - 2\bar{k}$$

The magnitude of the resultant vector is

$$|\bar{A}| = \sqrt{(3)^2 + (6)^2 + (-2)^2} = 7$$

A unit vector parallel to the resultant vector is

$$e_A = \pm\frac{\bar{A}}{|\bar{A}|} = \pm\frac{3\bar{\imath} + 6\bar{\jmath} - 2\bar{k}}{7}.$$

Answer: $\pm\frac{3\bar{\imath}+6\bar{\jmath}-2\bar{k}}{7}$.

Question

8 Given the scalar defined by φ(x,y,z)=3x2z–xy2+5,find φ at the points (-1,-2,-3)

Solution

$$\phi(x, y, z) = 3x^2z - xy^2 + 5$$

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

Answer: 0.

Question

9 The following forces act on a particle P: F1=2i+3j–5k, F2=−5i+j+3k,F3=i–2j+4k,F4=4i–3j–2k, Find the magnitude of the resultant

Solution

The resultant force is

$$\bar{F} = \bar{F_1} + \bar{F_2} + \bar{F_3} + \bar{F_4} = \left(2\bar{\imath} + 3\bar{\jmath} - 5\bar{k}\right) + \left(-5\bar{\imath} + \bar{\jmath} + 3\bar{k}\right) + \left(\bar{\imath} - 2\bar{\jmath} + 4\bar{k}\right) + \left(4\bar{\imath} - 3\bar{\jmath} - 2\bar{k}\right)$$
$$= (2 - 5 + 1 + 4)\bar{\imath} + (3 + 1 - 2 - 3)\bar{\jmath} + (-5 + 3 + 4 - 2)\bar{k} = 2\bar{\imath} - \bar{\jmath} - 0\bar{k}$$

The magnitude of the resultant force is

$$|\bar{F}| = \sqrt{(2)^2 + (-1)^2 + (0)^2} = \sqrt{5}.$$

Answer: $\sqrt{5}$.

Question

10 If a and b are non-collinear vectors and A=(x+y)a+(2x+y+1)b

Answer: the statement of question is not complete. What should be done there?