

Homework on Vector Operations 04:

1) If D(3, 4, 5) and E(-2, 1, 5) are points in space, calculate:

a) $|\overrightarrow{OD}|$ $\{5\sqrt{2}\}$ b) $|\overrightarrow{OE}|$ $\{\sqrt{30}\}$ c) \overrightarrow{DE} $\{(-5, -3, 0)\}$

d) $|\overrightarrow{DE}|$ $\{\sqrt{34}\}$ e) \overrightarrow{ED} $\{(5, 3, 0)\}$ f) $|\overrightarrow{ED}|$ $\{\sqrt{34}\}$

2) Find the magnitude and direction of the resultant of two forces of 15 N and 8 N acting at an angle of 130 degrees to each other. (geometrically and algebraically)

$\{11.6 \text{ N}, 32 \text{ degrees to } 15 \text{ N}\}$

3) If $\vec{u} = (5, -7)$ and $\vec{v} = (-2, 3)$, find $\vec{w} = 6\vec{u} - 4\vec{v}$ $\{(38, -54)\}$

4) Given $\vec{y} = 2\hat{i} + 2\hat{j} - \hat{k}$, $\vec{x} = (-1, 4, -3)$, $\vec{z} = (3, -2, 1)$, $A(-1, -3, 5)$, $B(-3, -2, 1)$

Find: a) \overrightarrow{AB} b) $|\overrightarrow{AB}|$ c) \hat{y} d) $-5\vec{x}$ e) $\vec{x} + \vec{y}$ f) $2\vec{x} - 3\vec{y} + \vec{z}$

$\{(-2, 1, -4), \sqrt{21}, (\frac{2}{3}, \frac{2}{3}, \frac{-1}{3}), (5, -20, 15), (1, 6, -4), (-5, 0, -2)\}$

5) Simplify: a) $3(\hat{i} - 2\hat{j} + 3\hat{k}) - 3(-\hat{i} + 4\hat{j} - 3\hat{k})$ b) $5(9\hat{i} - 7\hat{j}) - 5(-9\hat{i} + 7\hat{k})$ $\{(6, -18, 18), (90, -35, -35)\}$

6) If \overrightarrow{OA} , \overrightarrow{OB} and \overrightarrow{OC} are three edges of a parallelepiped where O is (0, 0, 0), A is (2, 4, -2), B is (3, 6, 1), and C is (4, 0, -1), find the coordinates of the other vertices of the parallelepiped.

$\{(7, 6, 0), (6, 4, -3), (5, 10, -1), (9, 10, -2)\}$

7) Demonstrate using vectors that the points A(33, -5, 20), B(6, 4, -16) and C(9, 3, -12) are collinear.

8) Find x, y and z if $2(x, -1, 4) - 3(-4, y, 6) - \frac{1}{2}(4, -2, z) = (0, 0, 0)$

$\{-5, -1/3, -20\}$

9) Are the points A(-3, 5, -2), B(2, -1, 8) and C(7, -7, 18) collinear?