Ćwiczenia 1

wtorek, 2 października 2018 11:16

ĆWICZENIA

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- zadania z e-portalu
- hasło: tpem
- 2 nieusprawiedliwione nieobecności
- ostatnie zajęcia – kolokwium
- plusy za aktywność – do kolokwium

nosić kalkulator

LITERATURA

- Łobos → „Teoria pola dla elektryków"
- Sikora → „Teoria pola elektromagnetycznego"
- Rawa → „podstawy elektromagnetyzmu"
- Jackson → Classical Electrodynamics
- Michalski → „elektryczność i magnetyzm"

LISTA 1

① $A = a_x + 3a_z \qquad B = 5a_x + 2a_y - 6a_z$ (wersor)

$|A+B| = |6a_x + 2a_y - 3a_z| = \sqrt{49} = 7$

$5A - B = 5a_x + 15a_z - 5a_x - 2a_y + 6a_z = -2a_y + 21a_z$

$3A + B = 3a_x + 9a_z + 5a_x + 2a_y - 6a_z = 8a_x + 2a_y + 3a_z$

$|3A + B| = \sqrt{64 + 13} = \sqrt{77}$

$\bar{U}_x = \frac{8}{\sqrt{77}}$

$\bar{U}_y = \frac{2}{\sqrt{77}}$

$\bar{U}_z = \frac{3}{\sqrt{77}}$

$\hat{U} = \frac{8}{\sqrt{77}} a_x + \frac{2}{\sqrt{77}} a_y + \frac{3}{\sqrt{77}} a_z$

② a) $P(1,-3,5) \quad Q(2,4,6) \quad R(0,3,8)$

$\vec{r}_{QR} = [-2\hat{i} - 1\hat{j} + 2\hat{k}]$

b) $|\vec{r}_{QR}| = \sqrt{4+5} = 3$

c) $\vec{r}_{QP} = [-\hat{i} - 7\hat{j} - \hat{k}] \qquad |\vec{r}_{QP}| = \sqrt{51}$

$\cos\alpha = \frac{\vec{a} \circ \vec{b}}{|\vec{a}| \cdot |\vec{b}|}$

$\cos\alpha = \frac{2+7-2}{3\sqrt{51}} = \frac{7}{3\sqrt{51}} \qquad \alpha = 79{,}93°$

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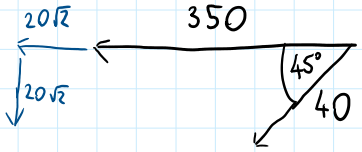
$$\vec{A}\times\vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix} = (A_yB_z - A_zB_y)\hat{i} + (A_xB_z - A_zB_x)\hat{j} + (A_xB_y - A_yB_x)\hat{k}$$

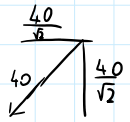
$$\vec{r}_{QR}\times\vec{r}_{QP} = [15, 4, 13] = P$$

$$|P| = \sqrt{225+16+169} = 29,24$$

$$P_\Delta = \frac{1}{2}P = 10,12$$

③





$$|\vec{v}| = \sqrt{(350+20\sqrt{2})^2 + (20\sqrt{2})^2} = 379,3$$

$$\alpha = \operatorname{arctg}\frac{20\sqrt{2}}{350+20\sqrt{2}} = 4,275^\circ$$

⑤ $A = a_x + 3a_z \qquad B = 5a_x + 2a_y - 6a_z$

$$\cos\alpha = \frac{A\circ B}{|A||B|} = \frac{5-18}{\sqrt{650}} \qquad \alpha = 120,6^\circ$$

$$|A| = \sqrt{10} \qquad |B| = \sqrt{25+4+36} = \sqrt{65}$$

⑥ $A = 3a_y + 4a_z \qquad B = 4a_x - 10a_y + 5a_z$

$$\vec{U} = \frac{\vec{A}\circ\vec{B}}{|\vec{B}|^2}\vec{B} \qquad \vec{U} = \frac{-30+20}{(\sqrt{141})^2}\vec{B} \qquad |B| = \sqrt{141}$$

$$\vec{U} = \frac{-40a_x + 100a_y - 50a_z}{141}$$

Wektor prostopadły: $\vec{U} = \frac{\vec{A}\times\vec{B}}{|\vec{A}\times\vec{B}|}$

$$\vec{A}\times\vec{B} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 0 & 3 & 4 \\ 4 & -10 & 5 \end{vmatrix} = [55, -16, -12]$$

$$\sqrt{55^2+16^2+12^2} = 5\sqrt{137}$$

$$\sqrt{55^2 + 16^2 + 12^2} = 5\sqrt{137}$$

$$\vec{v} = \frac{(55, -16, -12)}{5\sqrt{137}} = [0{,}94;\ 0{,}27, -0{,}21]$$

⑦ $a = (4, 0, -1)$ $b = (1, 3, 4)$ $c = (-5, -3, -3)$

$|a| = \sqrt{17}$ $|b| = \sqrt{26}$ $|c| = \sqrt{49}$

$\approx 4{,}1$ $\approx 5{,}1$ $\approx 6{,}5$

$4{,}1 + 5{,}1 > 6{,}5 \rightarrow$ trójkąt

$17 + 26 = 43 \rightarrow$ prostokątny

$P_\Delta = \frac{1}{2}\sqrt{17 \cdot 26} \approx 10{,}5$