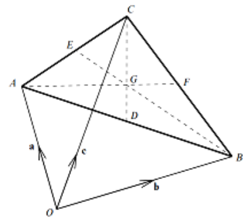
قائمة الاسئلة

امتحان نهاية الفصل الدراسي الأول - للعام الجامعي 1446 هـ - كلية العلوم :: الفيزياء الرياضية - (203106) - المستوى الثالث -تخصص فيز

محمد صالح قصيله

(1 *The vertices of triangle ABC have position vectors* **a**, **b** *and* **c** *relative to some origin O (see the figure). Find the position vector of the centroid G of the triangle.*



(1 + $(1/3)\ (\mathbf{a}+\mathbf{b}+\mathbf{c})$

(2 - $(1/3)\ (\mathbf{a}+\mathbf{b}-\mathbf{c})$

(3 - $(1/2)\ (\mathbf{a}+\mathbf{b}-\mathbf{c})$

(4 - $(1/2)\ (\mathbf{a}+\mathbf{b})$

(2 *if* $\mathbf{a}=\mathbf{b}+\lambda\mathbf{c}$, *for some scalar* λ, *then*

(1 + $\mathbf{a}\times\mathbf{c}=\mathbf{b}\times\mathbf{c}.$

(2 - $\mathbf{a}\times\mathbf{c}\neq\mathbf{b}\times\mathbf{c}$

(3 - $\mathbf{a}\times\mathbf{b}=\mathbf{b}\times\mathbf{c}$

(4 - **none of them**

(3 *the area A of the parallelogram with sides* $\mathbf{a}=\mathbf{i}+2\mathbf{j}+3\mathbf{k}$ *and* $\mathbf{b}=4\mathbf{i}+5\mathbf{j}+6\mathbf{k}$.

(1 + $\sqrt{54}$

(2 - $\sqrt{44}$

(3 - $\sqrt{45}$

(4 - $\sqrt{55}$

(4 the volume V of the parallelepiped with sides $\mathbf{a} = \mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$, $\mathbf{b} = 4\mathbf{i} + 5\mathbf{j} + 6\mathbf{k}$ and $\mathbf{c} = 7\mathbf{i} + 8\mathbf{j} + 10\mathbf{k}$.

(1 + 3

(2 - 1

(3 - 2

(4 - 5

(5 the radius ρ of the circle that is the intersection of the plane $\hat{\mathbf{n}} \cdot \mathbf{r} = p$ and the sphere of radius a centred on the point with position vector $\mathbf{c}$.

(1 + $\sqrt{a^2 - (p - \mathbf{c} \cdot \hat{\mathbf{n}})^2}$,

(2 - $\sqrt{a - (p - c.n)}$

(3 - $\sqrt{(p - c.n)^2 - a^2}$

(4 - $\sqrt{a^2 - (p.p - c.c)}$

(6 جسم صغير كتلته m يدور حول جسم ذو كتلة كبيرة M متمركزة عند نقطة الأصل. بحسب قانون نيوتن للجذب العام، متجه الموضع للجسم m يخضع للمعادلة التفاضلية :

$$m\frac{d^2\mathbf{r}}{dt^2} = -\frac{GMm}{r^2}\hat{\mathbf{r}}.$$

و علية فان المتجة $\mathbf{r} \times d\mathbf{r}/dt$ يكون : -

(1 + constant of the motion.

(2 - zero.

(3 - less than zero.

(4 -

none of them.

(7 *A curve lying in the xy-plane is given by $y = y(x)$, $z = 0$. the arc length along the curve between $x = a$ and $x = b$ is given by*

(1 + $$\int_a^b \sqrt{1+\left(\frac{dy}{dx}\right)^2}\, dx.$$

(2 - $$\int_a^b \sqrt{1-\left(\frac{dy}{dx}\right)^2}\, dx.$$

(3 - $$\int_a^b \left(1-\left(\frac{dy}{dx}\right)^2\right) dx.$$

(4 - $$\int_a^b \left(1+\left(\frac{dy}{dx}\right)^2\right) dx.$$

(8 In a magnetic field, field lines are curves to which the magnetic induction $\mathbf{B}$ is everywhere tangential. By evaluating $d\mathbf{B}/ds$, where s is the distance measured along a field line, the radius of curvature at any point on a line is given by

(1 + $$\frac{B^3}{|\mathbf{B}\times(\mathbf{B}\cdot\nabla)\mathbf{B}|}.$$

(2 - $$\frac{B^{3/2}}{|\mathbf{B}\times(\mathbf{B}\cdot\nabla)\mathbf{B}|}.$$

(3 - $$\frac{B^{3/2}}{|\nabla\times\mathbf{B}|}$$

(4 - $$\frac{B^3}{|\nabla\times\mathbf{B}|}$$

(9 مقلوب (reciprocal) المتجهات الاتية

$$\mathbf{a} = 2\mathbf{i},\ \mathbf{b} = \mathbf{j}+\mathbf{k},\ \mathbf{c} = \mathbf{i}+\mathbf{k}.$$

(1 + $\mathbf{a}' = \frac{1}{2}(\mathbf{i}+\mathbf{j}-\mathbf{k}),\ \mathbf{b}' = \mathbf{j},\ \mathbf{c}' = -\mathbf{j}+\mathbf{k}.$

(2 - $\mathbf{a}' = \frac{1}{2}(\mathbf{i}-\mathbf{k}),\ \mathbf{b}' = \mathbf{0},\ \mathbf{c}' = -\mathbf{j}+\mathbf{k}.$

(3 - $\mathbf{a}' = \frac{1}{2}(\mathbf{i}-\mathbf{j}),\ \mathbf{b}' = \mathbf{j},\ \mathbf{c}' = -\mathbf{k}.$

(4 - **none of them**

(10 Write the vector $\vec{m} = (1,2,3)$ as a linear combination of the vectors:
$\vec{u} = (1,0,1)\quad \vec{v} = (1,1,0)\quad \vec{w} = (0,1,1)$.

(1 + $\vec{m} = \vec{u} + 2\vec{w}$

(2 - $\vec{m} = \vec{u} + 2\vec{w} - \vec{\mathbf{v}}$

(3 - $\vec{m} = 2\vec{w} - \vec{\mathbf{v}}$

(4 - $\vec{m} = \vec{u} - \vec{w}$

(11 The vector $\vec{b} = \begin{bmatrix} 3 \\ 6 \\ 9 \end{bmatrix}$ is a linear combination of $\vec{v}_1, \vec{v}_2, \vec{v}_3$.

$\vec{v}_1 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \vec{v}_2 = \begin{bmatrix} 3 \\ 5 \\ 1 \end{bmatrix}, \vec{v}_3 = \begin{bmatrix} 0 \\ 0 \\ 8 \end{bmatrix}$ **Then** $\vec{b} =$

(1 + $\vec{b} = 3\vec{v}_1 + 0\vec{v}_2 + 0\vec{v}_3$

(2 - $\vec{b} = 3\vec{v}_1 + 3\vec{v}_2$

(3 - $\vec{b} = 3\vec{v}_1 + 3\vec{v}_3$

(4 - $\vec{b} = 3\vec{v}_1 - 3\vec{v}_3$

(12 *Two particles have velocities* $\mathbf{v}_1 = \mathbf{i} + 3\mathbf{j} + 6\mathbf{k}$ *and* $\mathbf{v}_2 = \mathbf{i} - 2\mathbf{k}$, *respectively. Find the velocity* **u** *of the second particle relative to the first.*

جسيمان لهما سرعات $\mathbf{v}_1 = i + 3j + 6k$ و $\mathbf{v}_2 = \mathbf{i} - 2\mathbf{k}$, على التوالي. سرعة الجسيم الثاني بالنسبة إلى الأول تساوي :

(1 + $-3\mathbf{j} - 8\mathbf{k}$

(2 - $3\mathbf{j} - 8\mathbf{k}$

(3 - $8\mathbf{j} - 3\mathbf{k}$

(4 - $-8\mathbf{j} - 3\mathbf{k}$

(13 The tangent of the angle between the two vectors $\mathbf{a} = i + 2j + 3k$ and $\mathbf{b} = 2i + 3j + 4k$ is equal to:

ظل الزاوية بين المتجهين $\mathbf{a} = i + 2j + 3k$ و $\mathbf{b} = 2i + 3j + 4k$. تساوي :

(1 + $\sqrt{3} / (10\sqrt{2})$

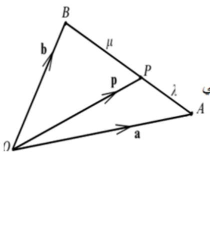
(2 - $\sqrt{2} / (10\sqrt{3})$

(3 - 6.98

(4 - $10(\sqrt{2} / \sqrt{3})$

(14 (In the opposite figure). If we rotate the position vectors a and **b** so that **b = j, a = i,** where **i** and **j** are unit vectors in Cartesian coordinates. And $\lambda >> \mu$, μ/λ goes to zero.
The angle between vectors **a** and **p** is equal to:

(في الشكل المقابل). إذا دورا متجها الموضع **a** و **b** بحيث اصبح $\mathbf{a} = i$ ، $\mathbf{b} = j$ حيث i و j متجهات الوحدة في الاحداثيات الكارتيزية. وكانت $\lambda >> \mu$, μ/λ تؤول الى الصفر.
الزاوية بين المتجهين **a** و **p** تساوي :



(1 +

90درجة

(2 - صفر

(3 - 180درجة

(4 - 45درجة

(15 العلاقة $\mathbf{a} \times \mathbf{c} = \mathbf{b} \times \mathbf{c}$ تقتضي الاتي

(1 + $\mathbf{c} \cdot \mathbf{a} - \mathbf{c} \cdot \mathbf{b} = c|\mathbf{a} - \mathbf{b}|.$

(2 - $(\mathbf{b} \times \mathbf{a}) \cdot \mathbf{c}.$

(3 - $(\mathbf{a} \cdot \mathbf{c})\mathbf{b} - (\mathbf{a} \cdot \mathbf{b})\mathbf{c}.$

(4 - $(\mathbf{a} \times \mathbf{b}) \times \mathbf{c}.$