SOLVING ALGEBRAIC PROBLEMS USING THE CONCEPT OF A VECTOR

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Abstract: This article shows the possibilities of proving algebraic problems using the concept of a vector, in particular inequalities, solving a system of algebraic equations and equations, finding the largest and smallest values of a function.

Key words: vector method, coordinate, equation, inequality, sum, root, system, trigonometry.

In this article, using the concept of a vector, ways of proving some inequalities in particular cases, finding solutions to certain types of algebraic equations and systems of equations, as well as examples of possible finding the largest and smallest values of a function are shown and considered.

In this article, we will show and consider, using the concept of a vector, methods for proving some inequalities in certain situations, finding solutions to certain types of systems of algebraic equations and equations, as well as examples of searching for the largest and smallest values of a function [1,2,3,4,5,6].

Science in principle depends in many ways on teaching students, together with non-standard thinking, to increase the effectiveness of mathematics education, to go to the gradual development of their mental system of perception. Naturally, mathematics is one of the important implementation methods in the process of teaching non-standard methods and techniques in accordance with the choice of educational content. In this regard, the teaching of mathematics in solving algebraic problems is relevant, in particular, the use of students of concepts from Vector, creative, non-standard thinking in order to add sufficient abilities to broad access to the practice of mathematics education in the development of a model. Since the mathematical concept of vector technique is one of the main concepts at the same time, many areas of this science, including linear algebra, analytical and differential geometry, are being described on the basis of a vector. Many of the vectors can be solved using the vector method and the theory of planametry, stereometry, both problems together with algebraic ones. Updated and expanded the use of vector method to solve the problem of vector properties associated with the main aspects of repetition on the one hand, as well as to ensure the integration of mathematical internal stages of science education, while the second updated and expanded leads to an existing analytical form by a complex interaction. a solution to a pure issue. O'do does not always mean that an issue can be resolved using a returned vector. Thus, the reader and the text should be able to learn the vector language to spend mostly updated issue and extended relationship [7,8,9,10,11,12,].

Do these updated and extended issues that require knowledge of the following concepts students will first apply the vector method in solving:
- the properties of the vector (the unit of length vector and zero vector, and the vector collinear complement, etc.).);
- the sum of the vector scalar and its properties;
- vector and mixed Koby time and its properties.

Description**:** $\vec{a}$ and $\vec{b}$ she sees the lengths of them with the angle between the vector form of the vector sum of the number kosinusi kopayib skalyar is called. $\vec{a}$ and $\vec{b}$ vector multiples skalyar $\vec{a}\vec{b}$ or $(\vec{a}\vec{b})$ form is determined.

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Using the concept of vector yechihda mainly the texture of the issues of an area skalyar updated and expanded use one of the following:

1. O any vector of 'z - skalyar multiples of this vector is equal to the length kvadrati to himself: $\vec{a}=(x;y;z)$ for vector $\vec{a}\cdot\vec{a}=|\vec{a}|^2=x^2+y^2+z^2$

2. The vector is perpendicular ($\vec{a}\perp\vec{b}$), $\vec{a}\vec{b}=0$.

3. $y=\cos x$ the function returns the value of the area $|\cos\varphi|\le 1$ from skalyar to the fact that the sum formula $\left|\dfrac{\vec{a}\cdot\vec{b}}{|\vec{a}|\cdot|\vec{b}|}\right|\le 1$, or $-|\vec{a}|\cdot|\vec{b}|\le|\vec{a}\cdot\vec{b}|\le|\vec{a}|\cdot|\vec{b}|$ is formed.

In particular, the equality sign $\vec{a}$ and $\vec{b}$ the vector achieves kollinear be.

Kollineareligi vector, the sum and using the inequality to prove its texture skalyar, updated and expanded to solve equations and systems of equations, the function of the largest and the smallest value you can find. We will take samples from below using the method of algebraic vectors to address issues causing issues[13,14,15,16,17,18].

1. To the proof of inequality issues.

1-issue. All $a\in\left[\dfrac{3}{2};\dfrac{50}{3}\right]$ real number $\sqrt{a+1}+\sqrt{2a-3}+\sqrt{50-3a}\le 12$ prove that disparity is reasonable.

(*Ukraine. Mathematics of the republic of olympic-1984 y.*)[2; 165 page.]

Is to take off. $\vec{a}\left(\sqrt{a+1};\sqrt{2a-3};\sqrt{50-3a}\right)$ and $\vec{b}(1;1;1)$ let's look at the vector. Without it $\vec{a}$ and the $\vec{b}$ vector $\vec{a}\cdot\vec{b}=\sqrt{a+1}+\sqrt{2a-3}+\sqrt{50-3a}\ge 0$, $|\vec{a}|=\sqrt{(\sqrt{a+1})^2+(\sqrt{2a+3})^2+(\sqrt{50-3a})^2}=\sqrt{48}$ and $|\vec{b}|=\sqrt{3}$ the seats relatable. Voluntary $\vec{a}$ and $\vec{b}$ vector for $|\vec{a}\cdot\vec{b}|\le|\vec{a}|\cdot|\vec{b}|$ the disparity are reasonable colossal that $\sqrt{a+1}+\sqrt{2a-3}+\sqrt{50-3a}\le\sqrt{48}\cdot\sqrt{3}=12$ came out.

2-issue. $\sin x\cdot\sin y\cdot\sin z+\cos x\cdot\cos y\cdot\cos z\le 1$ prove the inequality.

Proof. $\vec{a}(\sin x\cdot\sin y;\cos x\cdot\cos y)$ and $\vec{b}(\sin z;\cos z)$ let's look at the vector. Skalyar their multiples $\vec{a}\cdot\vec{b}=\sin x\cdot\sin y\cdot\sin z+\cos x\cdot\cos y\cdot\cos z$, while modules $|\vec{b}|=1$, $|\vec{a}|=\sqrt{\sin^2 x\cdot\sin^2 y+\cos^2 x\cdot\cos^2 y}\le\sqrt{\sin^2 x+\cos^2 x}=1$. $|\vec{a}\cdot\vec{b}|\le|\vec{a}|\cdot|\vec{b}|$ from the disparity $\sin x\cdot\sin y\cdot\sin z+\cos x\cdot\cos y\cdot\cos z\le 1$ toe formed'ladi.

2.Trigonometric issues of the equation.

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1-issue. Its the balance of the equation $\sqrt{4\cos^2 x+1}+\sqrt{4\sin^2 x+3}=4$. [6,7]

Of charging. $\vec{a}\left(\sqrt{4\cos^2 x+1},\sqrt{4\sin^2 x+3}\right)$ and the $\vec{b}(1,1)$ module of the vector $|\vec{a}|=\sqrt{\left(\sqrt{4\cos^2 x+1}\right)^2+\left(\sqrt{4\sin^2 x+3}\right)^2}=\sqrt{8}$, $|\vec{b}|=\sqrt{2}$ is equal to. Skalyar while their multiples $\vec{a}\cdot\vec{b}=\sqrt{4\cos^2 x+1}+\sqrt{4\sin^2 x+3}>0$. $|\vec{a}\cdot\vec{b}|\le|\vec{a}|\cdot|\vec{b}|$ disparities than $\sqrt{4\cos^2 x+1}+\sqrt{4\sin^2 x+3}\le 4$ the proper attitude. The equality sign $\vec{a}$ and $\vec{b}$ the vector kollinear toe legendaria will build. Therefore, the vector of the coordinates of proportional: $\sqrt{4\cos^2 x+1}=\sqrt{4\sin^2 x+3}$ $\Rightarrow$ $\cos 2x=\frac{1}{2}$ $\Rightarrow$ $x=\pm\frac{\pi}{6}+\pi n, n\in Z$.

2-issue. Its on the balance of the equation $\sqrt{2+\cos^2 2x}=\sin 3x-\cos 3x.$

Of charging. $\vec{a}(\sin 3x;\cos 3x)$ and $\vec{b}(1;-1)$ let's look at the vector. Let's find the equation of the sum of the vector field aniqlanih skalyar: $\vec{a}\cdot\vec{b}=\sin 3x-\cos 3x\ge 0$. $\vec{a}$ and $\vec{b}$ we are of the module of the vector is: $|\vec{a}|=1;\ |\vec{b}|=\sqrt{2}$ the sum of the lengths of them to $|\vec{a}|\cdot|\vec{b}|=\sqrt{2}$. Thus, $|\vec{a}\cdot\vec{b}|\le|\vec{a}|\cdot|\vec{b}|$ according to inequality $\sin 3x-\cos 3x\le\sqrt{2}$. Therefore, the given equation to be able yehimga $\cos^2 2x=0$ required must be completed. Also the solution of each equation $x=\frac{\pi}{4}+\pi n,\ n\in Z$ is equal to [19,20,21,22,23,24].

3.Equations steaming issues.

1-issue. Do not solve systems of equations:

$$\begin{cases}\sqrt{(x-1)^2+y^2}+\sqrt{(x+1)^2+y^2}=2\\ x^2+y^2=\sin^2 x.\end{cases}$$

Of charging. $\vec{a}\left(\sqrt{(x-1)^2+y^2},\sqrt{(x+1)^2+y^2}\right)$ and $\vec{b}(1,1)$ the vector is given. Without it $\vec{a}\cdot\vec{b}=\sqrt{(x-1)^2+y^2}+\sqrt{(x+1)^2+y^2}>0$, $|\vec{a}|=\sqrt{2\left(1+x^2+y^2\right)}$ and $|\vec{b}|=\sqrt{2}$. Voluntary $\vec{a}$ and $\vec{b}$ vector $|\vec{a}\cdot\vec{b}|\le|\vec{a}|\cdot|\vec{b}|$ than in the condition $\sqrt{(x-1)^2+y^2}+\sqrt{(x+1)^2+y^2}\le 2\sqrt{\left(1+x^2+y^2\right)}$ you will be able to inequality. The equality

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sign $\vec{a}$ and $\vec{b}$ the vector will be kollinear build. Therefore, the $\sqrt{(x-1)^2+y^2}=\sqrt{(x+1)^2+y^2}$ $\Rightarrow x=0.$ Second $x^2+y^2=\sin^2 x$ condition than in the $y=0.$ Therefore,has the unique solution of the system of equations: $x=0$ and $y=0$.

2-issue. $\begin{cases} x^2+y^2=3, \\ z^2+v^2=25, \\ xv+yz=5\sqrt{3} \end{cases}$ which build the system of equations in which all or $x+z$ expression find receive the greatest value.

[25,26,27,28,29]

Of charging. $\vec{a}(x;y)$ and $\vec{b}(v;z)$ let's look at the vector. Condition than in the $|\vec{a}|=\sqrt{x^2+y^2}=\sqrt{3}$, $|\vec{b}|=\sqrt{v^2+z^2}=\sqrt{25}=5$ and $\vec{a}\cdot\vec{b}=xv+yz=5\sqrt{3}$. Without it $\vec{a}\cdot\vec{b}=|\vec{a}|\cdot|\vec{b}|=5\sqrt{3}$ stems from the fact that. While that $\vec{a}$ and $\vec{b}$ come out of the same orientation and the vector koll. $\vec{e}=(u;w)$ let be the unit vector. Without it $\vec{a}=\sqrt{3}\cdot\vec{e}=(\sqrt{3}u;\sqrt{3}w)$ and $\vec{b}=5\cdot\vec{e}=(5u;5w)$. You $u=\cos\varphi$ and $w=\sin\varphi$ we have included on that set, $x=\sqrt{3}\cos\varphi$ and $z=5\sin\varphi.$ without it $x+z=\sqrt{3}\cos\varphi+5\sin\varphi=\sqrt{28}\sin(\varphi+\alpha)\le\sqrt{28}$. Therefore, $x+z$ the largest value of the expression $\sqrt{28}$ is equal to.

4.Largest and smallest function value generation.

1-issue. $y=\sqrt{x}+4\sqrt{1-\frac{x}{2}}$ find largest and smallest value of the function.

Of charging. $y=\sqrt{x}+4\sqrt{1-\frac{x}{2}}$ function $[0;2]$ in the range of not detected . Change the form of the function: $y=\sqrt{x}+4\sqrt{1-\frac{x}{2}}=\sqrt{x}+2\sqrt{2}\cdot\sqrt{2-x}$. Let's look at the following vector: $\vec{a}(1;2\sqrt{2})$ and $\vec{b}(\sqrt{x};\sqrt{2-x})$. The coordinates of this vector in the positive range to be detected. Therefore, $\vec{a}\cdot\vec{b}=\sqrt{x}+2\sqrt{2}\cdot\sqrt{2-x}$, $|\vec{a}|=\sqrt{(1)^2+\left(2\sqrt{2}\right)^2}=3$, $|\vec{b}|=\sqrt{(\sqrt{x})^2+(\sqrt{2-x})^2}=\sqrt{2}$. This vector for $0<|\vec{a}\cdot\vec{b}|\le|\vec{a}|\cdot|\vec{b}|$ the disparity is reasonable e'iborga beneficially $\vec{a}\cdot\vec{b}=\sqrt{x}+2\sqrt{2}\cdot\sqrt{2-x}\le3\sqrt{2}$. In particular, the equality sign $\vec{a}$ and $\vec{b}$

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the vector parallel to toe‘did it achieves, i.e. their coordinates proportional: $\frac{1}{2\sqrt{2}}=\frac{\sqrt{x}}{\sqrt{2-x}}$ $\Rightarrow$ $x=\frac{9}{2}$. Therefore, engkatta the value of the function $y_{\max}=y\left(\frac{9}{2}\right)=3\sqrt{2}$ is equal to. You $\vec{b}(2;0)$, that $x=2$ is the smallest function $y_{\min}=y(2)=\sqrt{2}$ value achieves[30,31,32,33,34].

Issues for independent work

1. $A,B,C>0,\ A+B+C=\pi$ Prove the following inequality. $\cos A+\cos B+\cos C\le\frac{3}{2}$

2. Prove the inequality. $\left|\frac{(x+y)(1-xy)}{(1+x^2)(1+y^2)}\right|\le\frac{1}{2}$

3. Find largest and smallest value of the function. $y=3\cos x+4\sin x$

4. All $a\in[0;16]$ real numbers for $4\sqrt{a}+3\sqrt{16-a}\le 20$ inequality o‘rinli prove that.

5. Find the largest value of the function $y(x)=\sqrt{x-8}+\sqrt{16-x}$ [35,36,37,38,39,40].

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