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POSITIVE AND NEGATIVE DIRECTIONS OF THE SURFACE INTEGRAL OF THE SECOND TYPE

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Abstract : This is article mathematician analysis from science written being , then second get up surface of the integral directions , definition , continuity and the first get up surface integral with mutually dependence , as well as second get up surface of integrals count method and styles about wide illuminated .

In the article second get up surface integrals about deep to knowledge have to be the goal by doing received

Key words: Integral, surface, private derivative , smooth surface , attempt , plane.

R^3 in space $z = z(x,y)$ equation with determined (S) the surface let's see In this $z(x,y)$ function limit lumpy-smooth from the line consists of has been (D) in the field $((D) \subset R^2)$ given , continuous , $z'_x(x,y)$, $z'_y(x,y)$ private to derivatives have and this derivatives are also continuous . Usually such the surface smooth surface is called Smooth surface each one (x_0, y_0, z_0) at the point don't try to the plain have will be

Now (S) surface his limit with non-intersecting K closed the line let's take (x_0, y_0, z_0) point of the surface K closed line with limited to the part belongs to let it be This line Oxy to the plane we project . As a result Oxy even K_{Π} in the plain closed line harvest will be (S) on the surface closed of the line positive and Minus directions second get up curve of the line directions such as is entered . It is as follows included :

Second get up curve line integral curve of the line direction depends will be That's it let's prove it is $\breve{A}B$ known that curve on the line two direction (A from the point B to the point and B from the point A to point). possible ($\breve{A}B$, $B\breve{A}$, $A \neq B$).

$\breve{A}B$ curve of the line above P to fragment take this to pieces relatively the following the total let's make :

$$\sigma' = \sum_{k=0}^{n-1} f(\xi_k, \eta_k)\Delta x_k \quad (\Delta x_k = x_{k+1} - x_k).$$

Let's say $\lambda_P \to 0$ it is total finite to the limit have be :

$$\lim_{\lambda_p \to 0} \sum_{k=0}^{n-1} f(\xi_k, \eta_k)\Delta x_k = \int_{\breve{A}B} f(x,y)dx .$$

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Now $\breve{A}B$ of that's it P fragmentation and each one $\breve{A}_k A_{k+1}$ in that's it (ξ_k, η_k) points take $\breve{A}B$ curve of the line direction while B from A to looking at this the total let's make :

$$\overline{\sigma'} = \sum_{k=0}^{n-1} f(\xi_k, \eta_k)(x_k - x_{k+1})$$

$\lambda_P \to 0$ at this total finite to the limit have if , it is defined according to this

$$\int_{\breve{B}A} f(x,y)dx$$

integral will be :

$$\lim_{\lambda_p \to 0} \overline{\sigma'} = \lim_{\lambda_p \to 0} \sum_{k=0}^{n-1} f(\xi_k, \eta_k) \cdot (x_k - x_{k+1}) = \int_{\breve{B}A} f(x,y)dx .$$

If

$$\sigma' = \sum_{k=0}^{n-1} f(\xi_k, \eta_k) \cdot \Delta x_k = -\sum_{k=0}^{n-1} f(\xi_k, \eta_k) \cdot (x_k - x_{k+1}) = -\overline{\sigma'}$$

that attention if we get , then $\lambda_P \to 0$ at σ_1 get together finite to the limit have from being $\overline{\sigma}_1$ get together too finite to the limit have to be and $\lim_{\lambda_P \to 0} \overline{\sigma}_1 = -\lim_{\lambda_P \to 0} \sigma_1$ of equality fulfillment we will find So ,

$$\int_{\breve{B}A} f(x,y)dx = -\int_{A\breve{B}} f(x,y)dx .$$

Same that's it similar

$$\int_{\breve{B}A} f(x,y)dy = -\int_{A\breve{B}} f(x,y)dy$$

will be

$\breve{A}B$ curve line Ox to the (Oy o ' qiga) perpendicular was correct line from the cross section consists of become $f(x,y)$ function that's it on the line given let it be

In that case

$$\int_{\breve{A}B} f(x,y)dx \quad \left(\int_{\breve{A}B} f(x,y)dy \right)$$

there is and

$$\int_{\breve{A}B} f(x,y)dx = 0 \quad \left(\int_{\breve{A}B} f(x,y)dy = 0 \right)$$

will be

This is equality directly second get up curve from the definition of line integral come comes out

Now $\breve{A}B$ - simple closed curve line be , that is A and B points on top of each other come down It is closed the line K let's define it as It's simple closed two on the line as well direction will be Theirs one positive direction , the second Minus accept as direction let's do it So direction

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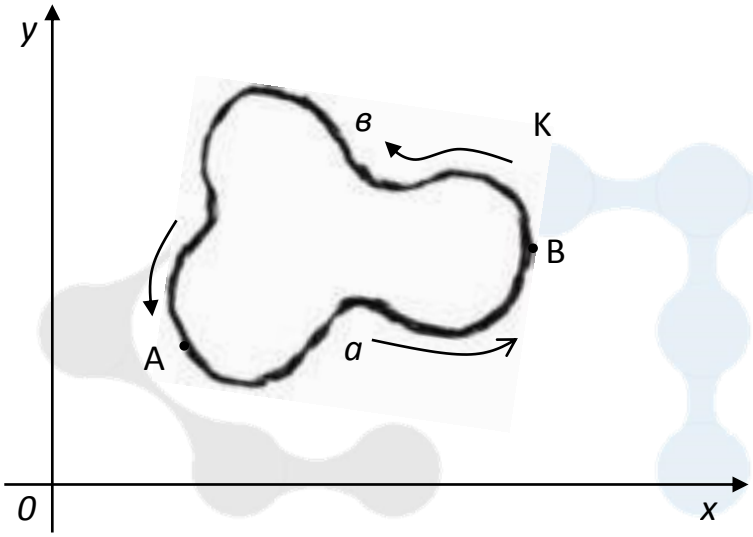
accepted as positive we do , observer closed line across movement closed when doing line with limited field to him relatively each always on the left let him sleep

Hypothesis let's do it , simple closed on the line $f(x,y)$ function given let it be This K on the line optional two different points take them A and B with let's define As a result , K closed line two $A\breve{a}B$ and $B\breve{e}A$ to the lines separates (Figure 61).



Drawing 1

This

$$\int_{A\breve{a}B} f(x,y)dx + \int_{B\breve{e}A} f(x,y)dx$$

integral (if it exists if) $f(x,y)$ of the function K closed line according to second get up curve linear integral that is called and

$$\int_K f(x,y)dx \quad \text{or} \quad \oint_K f(x,y)dx$$

such as is determined . In this K closed of the line positive direction received (From this since closed line according to received in integrals , closed line positive we see that in the direction). So ,

$$\oint_K f(x,y)dx = \int_{A\breve{a}B} f(x,y)dx + \int_{B\breve{e}A} f(x,y)dx .$$

Same that's it similar

$$\oint_K f(x,y)dy$$

and , in general without

$$\oint_K P(x,y)dx + Q(x,y)dy$$

integrals is defined .

$\breve{A}B$ spatial curve line being , this on the line $f(x,y,z)$ function given let it be As above , $f(x,y,z)$ of the function $\breve{A}B$ curve line according to second get up curve linear integrals is described and they are

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$$\int_{\breve{A}B} f(x,y,z)dx\,,\ \int_{\breve{A}B} f(x,y,z)dy\,,\ \int_{\breve{A}B} f(x,y,z)dz$$

such as is determined . General without , $P(x,y,z)$, $Q(x,y,z), R(x,y,z)$ functions given is this

$$\int_{\breve{A}B} P(x,y,z)dx\,,\ \int_{\breve{A}B} Q(x,y,z)dy\,,\ \int_{\breve{A}B} R(x,y,z)dz$$

integrals there is if

$$\int_{\breve{A}B} P(x,y,z)dx+\int_{\breve{A}B} Q(x,y,z)dy+\int_{\breve{A}B} R(x,y,z)dz$$

total second get up curve linear of the integral common appearance that is called and he

$$\int_{\breve{A}B} P(x,y,z)dx+Q(x,y,z)dy+R(x,y,z)dz$$

such as is determined . So ,

$$\int_{\breve{A}B} P(x,y,z)dx+Q(x,y,z)dy+R(x,y,z)dz=$$

$$=\int_{\breve{A}B} P(x,y,z)dx+\int_{\breve{A}B} Q(x,y,z)dy+\int_{\breve{A}B} R(x,y,z)dz\,.$$

That's it too to say should be of direction positive or negativity determination moving to the point where from the side to look at too dependent

of the surface (x_0,y_0,z_0) at the point don't try to the plain that's it at the point perpendicular let 's go . This of the perpendicular positive direction that so direction we can get it by when viewed both (K and K_{Π}) is closed of lines directions positive will be His Minus direction while so direction from that side when viewed K_{Π} of positive direction K of Minus direction suitable will come . of the perpendicular positive direction according to received unity cross section of the surface (x_0,y_0,z_0) at the point normal is called

Normal Ox , Oy and Oz of arrows positive directions with organize did corners suitable respectively α,β,γ through if we define

$$\cos\alpha=-\frac{z'_x}{\sqrt{1+z'^2_x+z'^2_y}}\,,\quad \cos\gamma=-\frac{z'_y}{\sqrt{1+z'^2_x+z'^2_y}}\,,\quad \cos\gamma=\frac{1}{\sqrt{1+z'^2_x+z'^2_y}} \qquad (1)$$

will be and they are normal referrer cosines is called

Proof maybe smooth (S) of the surface all points of perpendiculars positive directions (normals) are one different will be And , therefore , is negative directions too. That's it according to the surface two side about concept is entered .

of the surface top side that his so side it is obtained that from the side when viewed both (K and K_{Π}) is closed of lines directions positive will be

of the surface top side when viewed K_{Π} with limited flat of the form face positive hint with , bottom side (second side) when viewed Minus hint with is taken .

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