SCRIPT

INTRODUCTION

Aryan = Good evening , respected man and my dear fellow mates , we welcome u all for our presentation today so lets begin our presentation on the topic stoke's theorem .

So here are the partipants

And the topic we are going to present are :

over to u muskan

Muskan = stoke's theorem began at an early time around the year 1861 *It was first published by Hermann Hankel .This classical Kelvin–Stokes theorem relates the surface integral of the curl of a vector field F over a surface in Euclidean three-space to the line integral of the vector field over its boundary*

but the basic definition of stoke's theorem is

Aryan = *Stokes theorem says the surface integral of curlF over a surface S (i.e., ∬ScurlF·dS) is the circulation of F around the boundary of the surface (i.e., ∫CF·ds where C=∂S).*

And the mathematical equation can be stated as represented here.

STOKES' THEOREM

$$\int_C \mathbf{F} \cdot d\mathbf{r} = \int_C \mathbf{F} \cdot \mathbf{T}\, dS = \iint_S \operatorname{curl} \mathbf{F} \cdot \mathbf{n}\, d\mathbf{S}$$

Over to Amit

Amit = Wait, I have a que How can I apply Stoke's theorem in real life?

Abhyudaya would u like to ans

Abhyudaya=yes sure ,Well if you need to be doing any calculations about magnetic fields, then it is your best friend (via Ampère's law).

Otherwise....well, I guess it's as useful as any line integral?

"Real life" and "advanced calculus" is always a difficult question - because it depends on what your do with your life. Will you use it if you are a plumber? No. Will you use it if you are a theoretical physicist - more likely.

Over to anmol

Anmol,= lemme help u with spome over applications Basic use of stokes theorem arises when dealing wth the calculations in the areas of the magnetic field.

It relates the surface integral of the curl of a vector field with the line integral of that same vector field around the boundary of the surface.

Basically Stokes theorem is a 3-D version of the Green's theorem.

The need for Stokes theorem arises when dealing with the vector calculus.

ashutosh would u like to help

Ashutosh =adding on to that water turbines and cyclone may be a example of Stokes and Green's theorem.Stokes's theorem is a widely applicable theorem in mathematics as well

as in many other fields. This theorem is proved to be very important tool in combination with Gauss' theorem in order to work with different sorts of line integrals and surface integrals.

other field of application include:

Stokes' theorem is also used for the interpretation of curl of a vector field. This theorem is quite often used in physics, especially in electromagnetism. Stokes' theorem and its generalized form are very important in finding line integral of some particular curve and also in determining the curl of a bounded surface.

Siddharth will u continue

Siddhartha = Sure , well it depends on what you want to do with it.

Stokes theorem deals with the double integral of some boundary or region D of the curl of the vector field F•dr. Now we have to think about what the curl of a vector field gives us.

To put it a briefly, the curl of a vector field is an operator typically applied to 3-dimensional vector fields in form of:

Curl(F), where F = f(x,y,z)i + g(x,y,z)j + h(x,y,z)k

Where i, j and k are the x, y and z unit vectors.

Every point of the curl of the vector field is represented by a vector where the certain attributes of these vectors such as magnitude and direction give you an idea of the rotation of this vector field about some point. The double integral of this, however, gives you the total amount of "curl" or "twist" with respect to the boundary or region.

Anmol =however where can this apply?

Somardh = I would like to help u , this can apply to fluids, such as some liquid in a "whirl pool" motion. Or it can apply to electromagnetism.

Can u highlights some significance of stokes theorem Krishna

Krishna =Stokes' theorem can be regarded as a higher-dimensional version of Green's Theorem. Green's Theorem relates a double integral over a plane region to a line integral around its plane boundary curve. Stroke's Theorem relates a surface integral over a surface to a line integral along the boundary curve. In fact, The theorem provides insight into a physical interpretation of the curl. In a vector field, the rotation of the vector field

is at a maximum when the curl of the vector field and the normal vector have the same direction. In other words, while the tendency to rotate will vary from point to point on the surface, Stokes' Theorem says that the collective measure of this rotational tendency taken over the entire surface is equal to the tendency of a fluid to circulate around the boundary curve.

I would like my colleague satyam to explain futher

Satyam =Let us consider that a vector field F that represents the velocity field of a fluid flowOn the other side, the line integral of that field along the boundary of the surface represents the net flow of fluid along the boundary

according to stokes` theorem the value of surface integral of the curl over the surface will also be same for each surface. That is total amount of whirl will be same for each surface. Similarly, since the boundary line of a closed surface shrinks down to a point therefore the value of surface integral will also be equal to zero

Now my frd rupesh add some information on practical examples

Rupesh= We have seen the theoretical approach but can we really take this theorem to employ in the massive world that can work for our conveniences ? answer is yes so let us see how stoke's theorem works in reality

So here we have our examples in series visible on slide

Now let's see the first example as in Goods Transportation ships

Stokes theorem works in the bottom of ship

In the bottom there is a ballistic tank where the heavy equipments are present which control the flow of water here. This theorem helps to get accurate calculation which helps to maintain the flow of water at safe level

Can we use it anywhere else too Akshat ?

Akshat= yeah of course we are here with another example of Hydro Power Plants

As we know the basic working mechanism of dam but let us focus at the turbine part where the force due flow of water acts on turbine and helps us to get the precise

electricity generating capacity of dam. Are you thinking that is this the only application of stokes theorem here! No apart from the generating electricity it also works in the foundation of dam. Here when dam is built, engineers considers the force that the wall will bear due to storing water. Ok Anushka can you tell me the another such example of stokes theorem

Anushka= Ofcourse we can take example of a submarine. Submarines dive deep in the sea and under constant high pressure. So the stokes theorem here also works in the ballistic tank which is similar to as that of ship and apart from that it also plays its part in the construction of penultimate surface of submarine where we calculate approx. force at the surface due to environmental conditions so that submarine doesn't sink.

So here we limits the list of applications and move on further topic

Abhyudhaya = I understood the practical part now can someone help me out with the theoretical part

Shaili = ya sure, example 1 amit would u help with the solution of the que
amit = step 1 the statement of stokes theorem then with the necessary information we

find the curl F and finally with the help of stokes theorem the integral comes out be 2/3pie.

Abhyudhaya I understood this one can someone provide with another one
anushka = example 2
akshat = again we begin by stating stoke's theorem then next step we move on to find the value of curl F which comes out to be K and then finally by appling stokes theorem we get the double integration that is the area of ellipse as 6 pie [explain ans]

Muskan can u help me with another example for better understanding
muskan =example 3
Aryan = again here the same steps are followed firstly we begin by stating stokes theorem then we move on to the value of curl F which comes out to be [2 I+k] and finally the ans is seen to be 21

Abhyudhaya thanku I understood the this part

Muskan after all of this it seems that stoke's theorem is really imp its significance lies in vast fields but does it has any limitations

ankit = ya, I agree with that since everything has it own pros and cones ,doesn't that implies to stockes theorem

Somardh = yes absolutely it does as If the flow is not streamline it will not work(the flow in fluids in parallel layers such that there is no disruption or intermixing of the layers at a given point.)

It only works for infinite extent(having no limits and boundaries)eg: surface of sea,ocean

Conclusion

Shaili Finally we have talked about this a lot and gathered a lot of information so lets wind up the topic conclusion 1

Ankit = at last but not the least I would like to add on to that conclusion slide 2

Aryan = thanku so being for such an august audience