VENN EULER DIAGRAM ON THE INTEGRALS OF SET OVER ELLIPTIC SURFACES

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ABSTRACT

The theory of set can be understood if we make use of venn-euler diagram. The venn euler diagram can be much understood if we set in integrals into it and that is the main goal of this Research Paper. The venn euler diagram is an illustrative instructions which depicts relationship between sets and when integrals go along aside with it, it can be used to understand the logic of reality.

INTRODUCTION

Venn euler diagram on the integrals of set focuses on bringing integral and functions into set to understand a given area in which the set will be integrated into. Most research and theorem in mathematics make use of only the internal (x, y) but not all are conscious of the fact that intersection can be replaced to solve problems involving set, which gives a quite number of solution to some given logical problems. A set can be given in a form of x∈AnB and also commute to x∈BnA [1]. This kind of statement is a logical set statement, but the question now comes, how can we bring this statement into integration and this is the established research problem which the research maps
out. To simplify the question we can ask, how can we understand for example that \( x \in A \cap B \) using integration.

**METHODOLOGY**

For an ellipse constructed out of the venn euler diagram which is merely govern by a coordinate system [2]. So therefore if the coordinate position is fully observed, we could easily specify the region in which the element \( y \) can be found.

So in the case of finding the Region of Integration in which this element \( y \) can be found, we have to construct a venn diagram [3]. In the venn diagram the region where \( y \) can be found is an ellipse. So we are finding the differential area “d\(A\)” of an ellipse.

![venn euler diagram](image)

“The figure above shows the venn euler diagram, representing \( y \in A \cap B \)”. Figure 1

To find the differential unit of an ellipse, we have to find the area of an ellipse, which is the first step.
∴ Since the ellipse $x = a \cos \theta$ and $y = b \sin \theta$ is equally divided into four symmetrical regions, hence, the area of ellipse in cartesian coordinate is given as

$$4 \int_0^a y \, dx$$

Now changing in polar coordinate by setting $y = b \sin \theta$ and $x = a \cos \theta$ or $dx = a \sin \theta \, d\theta$, one should get area of an ellipse.

$$\int_{\pi/2}^{\pi/2} (b \sin \theta) (-a \sin \theta \, d\theta)$$

$$= 4ab \int_0^{\pi/2} \sin \theta \, d\theta$$

$$= 4ab \int_0^{\pi/2} \frac{1 - \cos 2\theta}{2} \, d\theta$$

$$= 4ab \left( \frac{1}{2} \int_0^{\pi/2} \, dt - \frac{1}{2} \int_0^{\pi/2} \cos 2\theta \, d\theta \right)$$

$$= 2ab \int_0^{\pi/2}$$

$$= 2ab \frac{\pi}{2} = \pi ab$$

The area of an ellipse is $\pi ab$. If we take a point along the curve and another small distance away along it, the area of the resulting triangle is in cartesian coordinate $\frac{1}{2}(x \, dy - y \, dx)$. Plugging in parameterization of the ellipse gives $dA = \frac{1}{2} ab \, d\theta$, which will clearly give the results when integrated.
RESULT AND DISCUSSION

To describe the venn euler diagram using integral, a general equations is given
\[ \int_{y \in (f(AnB))} dA. t = \int_{y \in (f(AnB))} 2ab d\theta. t \]

This equation describes the diagram in figure “1”. To describe the equation, when we have a continuous function with more than one variable, lets call it f(AnB), we can compute its integral on a region of the plane lets call it r. in this case we are not using the interval (A, B) with which we are used to working.

1. We will then write \[ \int_{y \in r} y \in (f(AnB)) \]. the notion y \in r comes from figure “1”. The ellipse is the region and y is in the ellipse. So we say that y \in r \subseteq AnB. This means that the intersection of A and B makes up r.

2. For the case of f(AnB), we can prove an element of f(A) n f(B) can come from a single element in AnB or two distinct element in AnB. An element of f(AnB) can only come from one distinct element in AnB. We first deal with one distinct element which can be shown using the logic of set membership and introduction.

For a function f: x \rightarrow y, the set membership logic for an element y \in Y is y \in f(x) \iff y = f(x). From here on “for some x \in X (or a \in A etc), will be implied when f(X) (or f(A) etc) appears. To make reading more easier, the y \in AnB \iff (y \in A) \land (y \in B).
Now lets deal with the case of two distinct element. Now get to the \( f(AnB) \subseteq f(A) \cap f(B) \). If \( y \in f(AnB) \) then \( y = f(x) \) for some \( y \in (AnB) \). That is \( y \in A \) and \( y \in B \). Therefore \( f(x) \in f(A) \) and \( f(x) \in f(B) \), that is \( y = f(x) \in f(A) \cap f(B) \). We get to the tricky part of it. \( y = f(x) \in f(A) \cap f(B) \). Then \( y \in f(A) \) and \( y \in f(B) \) that is for some time \( X_1 \) in \( A \) we have \( f(X_1) \) and for some \( X_2 \in B \) we have \( f(X_2) = y \). since \( X_1 = X_2 \) if and only if \( f \) is injective we cannot conclude or include that \( y \in f(AnB) \) unless “\( F \)” is injective. So in this Result lets assume that “\( F \)” is injective.

A man and his shadow is an injective statement, for this research a full circle and part of his circle is also an injective statement, which describes figure (1).

To make the prove more easier, we write let \( y \in f(AnB) \). So there is a \( y \in AnB \), so \( f(x) = y \in f(AnB) \). Then obviously \( y \in A \), so \( y = f(x) \in f(A) \). Also \( y \in B \), so \( y = f(x) \in f(B) \). This proves that \( f(AnB) \subseteq f(A) \cap f(B) \). So the equation \( \int_{x \in r} ye (f(AnB)) \) still stands.

3. Lets complete the equation that describes the venn euler diagram i.e the differential unit of the area, which have been calculated in the methodology as \( \frac{1}{2} ab d\theta \). So we can write it as \( 2ab d\theta \). When completing the equation we add “\( t \)” which is time “representing that \( y \) was in \( A \) and \( B \) at the same time. “\( t \)” is brought in, in case the equation wants to adopt a physical application.
So by completing the equation we write.

\[ \int_{\gamma_r} y \epsilon \left( f (A \cap B) \right) dA \cdot t = \int_{\gamma_r} y \epsilon \left( f (A \cap B) \right) 2ab d\theta \cdot t \]

The equation above one's and for all describe venn-euler diagram using integral.

CONCLUSION

When venn diagram are called into the podium of integrals, the equations in the results are used – its interesting to say that the integration of logic and integration of calculus are put in touch together with such simplicity. The application of this mathematical formulation would cover a quite range of physical science to understand phenomenon. In summary the equations will give numerous solution to numerous given problems.

REFERENCES

1. E. Egbe “Further Mathematics”.

2. “Intersection of sets” web.mnstate.edu.retrieved 2020-09-04