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DERIVATIVES AND INTEGRALS OF DISCRETE MATHEMATICS

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Abstract: **The universes, the matter, are finite, so there is a few in matter, which Democritus called an atom. The consequence of this is that, in mathematics that reflects matter, there is no limit tending to zero, so calculus is completely wrong! So, we need discrete mathematics, with differences that do not tend to zero.**

There are two types of differences, two ways to express the difference of a variable in a function. In both ways we are led to different integrals and derivatives, which both ways of difference give. These have specific applications in physics and statistics and in the other sciences.

The results of discrete mathematics are very different from that of calculus, which was applied and bridges and spaceships fell and nuclear accidents occurred!

Discrete mathematics is the result of tight, consistent and realistic logic, which requires complete consistency with the existence of matter and its structure.

Keywords: **discrete mathematics, bridges and spaceships fell, nuclear accidents, realistic logic.**

1. INTRODUCTION

For nature, only two things can happen, and not at the same time. Or that it constantly intersects at infinity, or has one or only a few parts of matter, distinct, the atmetes or atoms according to Democritus.

In my youth, I argued that it intersects at infinity, so that matter is filled with ever smaller particles,

Modern physics tends to support the Big Bang, in which case matter is finite and therefore there is or is little matter, distinctfrom each other.

With the invention of my cosmic theory and the[1] advent of the ether, there are very few parts of matter, and the ether is the emptiness of matter, since it is not matter, and fills it.

The infinite divisiveness of matter was supported by Anaxagoras and the few by Democritus. According to logic, Democritus prevails, matter has few or atoms.

Calculus in mathematics accepts a limit that tends to zero, the dx of the derivative dy/dx. Because mathematics is a reflection of nature, strict, concise and often symbolic, and calculus is completely wrong[2]. Otherwise we are describing non-existent universes!

This does not mean that there are no limits, but a limit towards zero does not exist.

2. METHODOLOGY

As any major theory should, it must have a principle or principles. Discrete mathematics has a philosophical principle, the indivisibility of matter, atoms. This is reflected in their structure and they rely on the variable, e.g, x, which has a difference of $\Delta x=x_2-x_1$. Many times $\Delta x=x$, because x is finite.

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[1] THE TOTAL THEORY, International Journal of Mathematics and Physical Sciences Research, Apr2020-Sept2020

[2] ALEKOS CHARALAMPOPOULOS, OVERTURNING OF INFINITESIMAL CALCULUS AND RESTORATION OF THE MATHEMATICS IN CONNECTION WITH THE COSMIC THEORY "THE IDION' International Journal of Mathematics and Physical Sciences Research, Oct2020-Mar2021

Then inductive and abductive reasoning is developed, in order to build the new mathematics! As is due because mathematics is strict and concise logic, the laws of logic are applied to the full extent, with a serious effort to avoid errors.

THE GENERAL DISPUTE

We have the general function $f(x)=y= ax^n+bx\ n-1+cx^{n-2}+....+px+q$.

The difference $\Delta f(x)=f(x_2)-f(x_1)$ in the first way will be,

First way

$$\Delta f(x)= a(\Delta x)^n+b(\Delta x)^{n-1}+......+p\,\Delta x$$

And the derivative, $\Delta f(x)/\Delta x = a(\Delta x)n-1+b(\Delta x)^{n-2}+... .+p$

$$\Delta f(x) =q+ \{\Delta f(x)/ \Delta x\}\Delta x$$

This difference is discernible because Δx is distinct. In any cases where $\Delta x=x$, e.g, $\Delta r=r$, we substitute $\Delta x=x$ in the second part of the equation.

THE LINEAR EQUATION

In mathematics we have the linear equation or function $f(x)=y= A+bx$. A and b are constants. Their difference will be,

$$\Delta f(x)=f(x\ 2)-f(x_1)=y\ 2-y_1= \Delta A+ \Delta(bx)= b\,\Delta x.$$

We define as the derivative of the function, according to the first way, the

$$\Delta f(x)/ \Delta x = \Delta y/ \Delta x = b=b(x^0).$$

So, $\Delta f(x)/\Delta x =\{f(x_2)-f(x_1)\}/\Delta x=(y_2-y_1)/ \Delta x = bx^{1-1}$.

EQUATION n POINT

If we have $f(x)=A+bx^n$, then according to the first way,

$$\Delta f(x)=f(x\ 2)-f(x_1)=y\ 2-y_1= \Delta A+\Delta(bx^n).\ \text{Then,}$$

$$\Delta f(x)/\Delta x= \Delta y/\Delta x = b(\Delta x)^{n-1}$$

$$\Delta f(x)= \Delta y= A+\{\Delta f(x)/\Delta x\}\Delta x.$$

THE CONCEPT OF DERIVATIVE BUT NOW

We have $f(x)=A+bx^n$, $\Delta f(x)=b(\Delta x)^n$ and $\Delta x' = x^n-x^{n-1}=x^{n-1}(x^1-1)$, then,

$$\Delta f(x)/\Delta x' = \Delta f(x)/ x^{n-1}(x^1-1)= b(\Delta x)^n/x^{n-1}(x^{1-1}) ,$$

$$\Delta f(x)/ \Delta x^{n-1} =b\,\Delta x'\Delta x/x^{n-1}(x-1)= b\,\Delta x.$$

$$\Delta f(x)/ \Delta x^{n-1} = b\,\Delta x= b(\Delta x)^n/(\Delta x)^{n-1}.$$

$$\Delta f(x)/ \Delta x = b\,(\Delta x)^{n-1}$$

All this according to the first way.

INTEGRATIONS AND DERIVATIVES

We again consider the linear form of the function $f(x)=A+bx$. Conversely now from the derivative we calculated, the integral according to the first and for $x=Dx$ is,

$$F(x)=\int(A + bx)\Delta x =Ax+bx^2=xf(x)$$

No need for a constant C.

The difference of the integral will be, $\Delta F(x)= \Delta x b \Delta x=b(\Delta x)^2$. That is,

$$\Delta F(x)/\Delta x = \Delta f(x) = b \Delta x$$

$$\Delta f(x)= \Delta F(x)/\Delta x$$

$$f(x) = A+ \Delta F(x)/\Delta x$$

The integral of the $f(x)=bx$ n will be $F(x)= \Delta x=\int(bx^n)bx^{n+1}/n$.

TO SEE DIFFERENT DIFFERENCE

We consider the linear function $f(x)=A+bx$. Now we define, according to the second way, the difference,

Second way

$$\Delta f(x)=A+b(x+\Delta x_1)-f(x) \text{ οπότε,}$$

$$\Delta f(x)=\{(A+bx+b\Delta x_1)-A-bx\}=b\Delta x_1$$

$$\Delta f(x)/\Delta x_1 =b.$$

That is, we find the same value as the one we found with $\Delta f(x)=b\Delta x$.

Generally between the two modes, $\Delta x\neq\Delta x_1$,

For $f(x)=bx^2$ by the first method we find $\Delta f(x)=b(\Delta x)^2$ and

$$\Delta f(x)/\Delta x =b\Delta x.$$

By the second method we find, $\Delta f(x)=b(x+\Delta x_1)^2-f(x)=2\Delta x_1 +(\Delta x_1)^2$, so

$$\Delta f(x)/\Delta x_1 =2+\Delta x_1.$$

If $\Delta x=\Delta x_1$ then $b\Delta x=2+\Delta x$ and $\Delta x=2/(b-1)$. Now Δx takes a certain value. In this case, we avoid $\Delta x=x$.

NTEGRAL IN THE SECOND WAY

The derivative of the $f(x)= A+bx^k$ is,

$$\Delta f(x)/ \Delta x = \{(A+b(x+\Delta x)^k)-A-bx^k\}/\Delta x$$

$$= bx^k\{ n(\Delta x/x)+ 1/2\, n(n-1)(\Delta x/x)\ 2+.... \} /\Delta x \text{ and}$$

$$\Delta f(x)/\Delta x= bx^{k-1}\{n+ 1/2\, n(n-1)(\Delta x/x)+ (1/6)n(^{n-1})(n-2)(\Delta x\ /x)2+...\}\ ;$$

The integral will be, $F(x)= \int(\Delta f(x)/\Delta x)\Delta x=$

$$=A+(bx^k/k)n$$

That is, $f(x)=bx^k$, $F(x)= \int bx^k\Delta x A+bx^{k+1}/n$, and the A=constant

THE GENERAL FUNCTION

Now since the difference according to the second way, of the general function $f(x)=A+bx^n$ will be,

$$\Delta f(x)=A+b(x+\Delta x)^n-f(x) \text{ και}$$

$$\Delta f(x)=bx\, n\{1+(\Delta x/x)\}n-bx^n=bx\, n\{ n(\Delta x/x)+ 1/2\ ^n(n-1)(\Delta x/x)^2+.... \}$$

(in accordance with the development of the formula) . And

$$\Delta f(x)/\Delta x= bx^{n-1}\{n+ 1/2\, n(n-1)(\Delta x/x)+ (1/6)n(n-1)(n-2)(\Delta x/x)2+...\}$$

For this function, with the other first method we found,

$$\Delta f(x)/\Delta x= \Delta y/\Delta x = b(\Delta x)^{n-1}$$

From the two equations we find if we equalize the two Δx of the two modes,

$$b(\Delta x)^{n-1} = bx^{n-1}\{n+ 1/2\ n(n-1)(\Delta x/x)+ (1/6)n(^{n-1)(}n-2)(\Delta x/x)^2+... \}\text{and}$$

$$(\Delta x/x)^{n-1} = \{n+ 1/2\ n(^{n-1})(\Delta x/x)+ (1/6)n(n-1)(n-2)(\Delta x/x)^2+...$$

Then n takes the unique value n=1. That is, it is the linear function whose difference in the first way we examined is $\Delta f(x)=b\,\Delta x^n$ and n=1 (first-order linear function), and since Δx=x, it is the same difference in both ways .

This means that for the linear function f(x)=bx we will have the same Δx=x in both ways at the same time of the difference Δ f(x)=b Δ x and Δ f(x)=b(x+Δx)-f(x).

WAVE EQUATION DIFFERENCE

We have the wave equation y=Acos(ωt+φ). The difference will be, according to the first way,

$$\Delta y=A\cos(\omega\Delta t+\varphi)$$

In wave equations Δt=T=wave period and,

$$\Delta y=A\cos(2\pi+\varphi)=A\cos\varphi.$$

$$\Delta y/\Delta t=(A/T)\cos\varphi=(\omega A/2\pi)\cos\varphi.$$

But cosφ=-sin((π/2)+φ) to permutation of the original condition φ by π/2. So,

$$\Delta y/\Delta t=-(A\omega/2\pi)\sin\{(\pi/2)+\varphi\} \text{ and}$$

$$\Delta y/\ \Delta t^2=-(A\omega\ 2/4\pi^2)\cos\varphi$$

We see the velocity and acceleration of y in initial and different conditions, and we can have an initial value of φ, so much so that it corresponds to the value of velocity or acceleration that we want to find.

But, beyond the two ways of difference, we can consider the cosine unknown, and,

$$\Delta y= A\Delta\cos(\omega t+\varphi)= \Delta\{1-\sin^2(\omega t+\varphi)\}^{1/2} =A\{\Delta(\Delta 1)- \Delta^2 \sin^2(\omega t+\varphi)\}^{1/2}=-\Delta \sin(\omega t+\varphi)$$

$$\Delta y=-\sin(\omega\Delta t+\varphi)=-\sin(2\pi+\varphi)=-\sin \varphi.$$

$$\Delta y/\Delta t = -(A/T)\sin \varphi=-(\omega A/2\pi)\sin \varphi=-(v/2\pi)\sin\varphi.$$

φ is the initial condition, but it can at the same time be the oscillation angle, at which we will find the velocity Δy/Δt with different initial conditions.

Acceleration will be,

$$\Delta y/\Delta t^2= (A/T^2)\ \Delta\cos(\omega t+\varphi)=-(\omega^2A/4\pi^2)\cos\varphi.$$

According to the second way, it will be,

$$\Delta y= A\cos(\omega t+\varphi+\omega\Delta t)-A\cos(\omega t+\varphi)$$

Δt=T και, Δy=0.

DIFFERENCE IN FUNCTION LIMIT e

We have the function, $f(x)=e^x$. Then in the first way,

$$\Delta f(x)/\ \Delta x=e^{\Delta x}/\Delta x=(\ln\Delta x)/\ \Delta x.$$

And according to the second, $\Delta f(x)/\ \Delta x=\{e^{x+\Delta x}-e^{x}\}/\Delta x=(e^{x(1+\Delta x/x)})-e^{x})/\ \Delta x$, and

$$\Delta f(x)/\ \Delta x= (e^x/\Delta x)(e^{(1+\Delta x/x)}-1)=\{(\ln x)/\ \Delta x\}\ (\ln(1-\Delta x/x)$$

We can do the calculations with Dx=x.

DIFFERENCE IN LOGARITHM COMPONENT

We have the function, $f(x)= \ln(x^n)$. Then in the first way,

$$\Delta f(x)/\Delta x = \ln(\Delta x^n)/\Delta x.$$

And in the second way, $\Delta f(x)/\Delta x= \{\ln(x+\Delta x)^n-\ln x\}/\Delta x$,

$$=\{\ln[x(1+\Delta x/x]^n-\ln x \qquad \text{and}$$

$$\Delta f(x)/\Delta x= \ln[x\{n+ 1/2\, n(n-1)(\Delta x/x)+ (1/6)n(n-1)(n-2)(\Delta x/x)^2+\dots \}],$$

$$=\ln(\{n+ 1/2\, n(n-1)(\Delta x/x)+ (1/6)n(n-1)(n-2)(\Delta x/x)^2+\dots \},$$

WHEN TO USE THE FIRST AND WHEN TO USE THE SECOND WAY

In physics, where the force is, $F=km\,\omega^2 r=km\omega^2 r^4/r^3=k'/r^3$ as in atomic and planetary physics, total energy is $E=k'/r^2$, then we move from force to energy, with first-mode integration without integral constant, and from energy to force, by derivative of the first mode, $F=\Delta E/\Delta r=k'/r^3$. Note that in harmonic oscillations, $\Delta r=2r$ or $\Delta R= R$ in the hydrogen atom ($R=2r$).

In some distributions of statistics, we use the first way, and some the second way, to find arithmetic averages and torques and variations.

EPILOGUE

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