

Hodges Conjecture Clay Institute Millennium Problem Solution

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Abstract: Here we consider the Hodge's Conjecture that expresses when a projective manifold coincides with a sum of algebraic cycles. More generally, this entails the convergence of geometry and calculus which has been discussed in this author's previous paper.

Keywords: Hodge's Conjecture; Polynomials; Analytic sums; Geometry; Calculus.

INTRODUCTION

In his paper, we consider the Hodge's Conject Clay Institute Millennium Problem solution. That problem is described as follows:

HODGE CONJECTURE

Let X be a non-singular complex projective manifold. Then every Hodge class on X is a linear combination with rational coefficients of the cohomology classes of complex sub varieties of X .

The Problem

The **Hodge Conjecture** addresses the following natural question:

Let X be a projective manifold. Suppose C is a **topological cycle** on X . When is C homologous to a formal sum of **algebraic cycles**?

One obvious condition: Since an algebraic cycle is complex, it has even (real) dimension.

A typical issue in geometry: Find a **geometric** representative of a **topological equivalence class** of "cycles"

Hodge's proposed characterization of sums of algebraic cycles brings in our final theme:

- **Interplay between geometry and calculus**

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Arena for the Hodge Conjecture


A final generalization in our point of view:

$CP^n \xrightarrow{\hspace{1cm}}$ projective manifold X

A **projective manifold** X is defined by (smooth) polynomial equations:
 $X: P_1(x^1, x^2, \dots, x^n) = P_2(x^1, x^2, \dots, x^n) = \dots = P_s(x^1, x^2, \dots, x^n) = 0$

An **algebraic cycle** C in X is given by additional polynomial equations:
 $C: Q_1(x^1, x^2, \dots, x^n) = Q_2(x^1, x^2, \dots, x^n) = \dots = Q_t(x^1, x^2, \dots, x^n) = 0$

The Hodge Conjecture concerns algebraic cycles in projective manifolds.



Ibid.

Consider:

$CP^n \rightarrow$ Projected Manifold X Eq.(1)

$X = \text{Polynomial } \mathbb{P}^n$ Eq.(2)

$C = \text{Analytic function} = \text{transcendental (sin, Ln, e)}$ Eq.(3)

Let X be the variable in the Golden Mean Polynomial

$x^2 - x = 0$ Eq.(4)

$x(x-1) = 0$ Eq.(5)

$x = 0$ Trivial

$x = 1$ singular

$X = 2 \quad y = 4$ Eq.(6)

$X = 3 \quad y = 6$

$X = 4 \quad y = 12$

$X = 5 \quad y = 20$

$X = 6 \quad y = 30$

$X = -1 \quad y = 2$

$X = -2 \quad y = 6$

Etc.

Therefore, roots are always even.

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$$\text{Let } \sum C=C \quad \text{Eq.(7)}$$

Therefore, the function equals the derivative.

$$\int C=C^2/2=C \quad \text{Eq (8)}$$

$$C^2=2C$$

$$C=2$$

$$C\mathbb{P}^n=2\mathbb{P}^n=X \quad \text{Eq. (9)}$$

$$2\mathbb{P}^n=x^2-x-0 \quad \text{Eq.(10)}$$

$$2\mathbb{P}^n=1$$

$$\mathbb{P}^n=1/2$$

$$\mathbb{P}^n=\sqrt[n]{1/2}=1/\sqrt[n]{2} \quad \text{Eq.(11)}$$

$$\text{Let } C'=2/3 * 2^{3/2}=0.4242 \sim \pi-e \quad \text{Eq.(12)}$$

$$C=\int(\pi-e^x) dx= x-e^x \quad \text{Eq.(13)}$$

$$C\mathbb{P}^n= (x-e^x) (1/\sqrt[n]{2})=x^2-x \quad \text{Eq.(14)}$$

So, the solution is:

$$x^2-x- (x-e^x) (1/\sqrt[n]{2})=0 \quad \text{Eq. (15)}$$

When n=1, the last term becomes $\sin 45^\circ = \cos 45^\circ$

And the natural logarithm function:

$$\text{when } x=1, y=0$$

&

$$y'=y=1 \quad \text{Eq.(16)}$$

This is the ln function.

$$\sin u +v+x^2+y^2=z^2 \quad \text{Eq.(17)}$$

$$\text{For } x^2 +y^2 = z^2 =\text{Radius}=1 \quad \text{Eq.(18)}$$

$$\text{When } x=1, y=0$$

$$\sin u +v +\sin x^2 +\sin Y^2 = \sin (1) \quad \text{Eq.(19)}$$

$$0.8415 +(-0.8415) + (\sin^2 1)+(\sin^2 0)= 0.8415 \quad \text{Eq.(20)}$$

$$\sin^2 0 =0$$

$$\sin^2 1=0.8415$$

$$0.8415-0.8415+0.0 +0.8415=0.8415$$

$$0+0.8415 =0.8415 \quad \text{Eq.(21)}$$

True!

CONCLUSION

We have worked out a possible set of solutions to the Hodges Conjecture. We have considered Analytic functions, C, summed into the general polynomial, P. This allows us to mold geometry and calculus together.

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