Физико-математические науки

From G. Galilei's paradox up to the alternate analysis

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Having unclosed paradox that of natural numbers are as much how many their quadrates, G. Galilei bequeathed to be cautious in the handling with infinite amounts: " …there isn't the place for a property of an equality, and also greater and smaller value there, where the matter goes about infinity, and are applied only to finite amounts" [1, p. 140-146]. An explanation of this paradox can be obtained with some conditions, which have allowed to divide all injective mappings $j: N \to N$ on four classes: 1) finitely surjective, 2) potentially surjective, 3) potentially antisurjective and 4) are as trivial antisurjective mappings. The following statements are proved, in particular:

Theorem 1. The injections of 3-rd and 4-th classes are not bijections.

Theorem 2. If a mapping $j: N \to N$ is bijection, then the following limit equality is fulfilled:

$$lim\left(j\left(n\right):n\right)=1.$$

Theorem 3. There isn't a bijection between of natural numbers set N and its proper subset $A \subset N$.

Theorem 3 can be proved also by means of the mathematical induction method or with the helping of the following statement.

Theorem 4. Let A and B be proper subsets of set N of natural numbers and there is an injection $j : A \to B$, then this mapping j can be prolonged up to bijection $y : N \to N$.

The concept of numerical sequence convergence is generalized as follows:

Definition 1. A numerical sequence (***a***) will be termed as a properly convergent sequence, if

$$\lim(a_n - a_{n-1}) = 0. \tag{1}$$

This concept gives the substantiation to existence of infinite hyper-real numbers. In particular, the sequence of the partial sums of a harmonic series satisfies to a condition of Definition 1. It is easy to proof following statement by means (1):

Theorem 5. A set of Cauchy's sequences includes a subset of unlimited those.

Corollary of Theorem 5. The real numbers set R isn't a complete space if it doesn't include a subset of infinite hyper-real numbers.

A completeness axiom will be entered: every properly convergent sequence converges

Theorem 6.

Theorem 4.

The defined more exactly concept of numerical series has allowed to prove and to show on examples both a necessary criterion of the numerical series convergence on the extended numerical direct $\overline{R}$ is also sufficient, and the convergence of an alternating numerical series in R does not depend on a permutation of this series addends [2]. For example, let (***A***)= $\sum(-1)^{n+1}n^{-1}$ =A=ln2. The series (***B***) was obtained [3, p. 316-319] from the series (***A***) by following "procedure": after everyone p of sequential positive addends of the series (***A***) was put q of the sequential negative addends of this series. The sequence ($\tilde{S}_n$) of partial sums of series (***B***) converges to number $\tilde{S}$ =ln(2 $\sqrt{p:q}$). It is shown in the report the sequence ($\tilde{r}_n$) of series (***B***) residuals converges to number $\tilde{r}$ =ln($\sqrt{q:p}$). Therefore, A= $\tilde{S}$ + $\tilde{r}$.

Reference

1. Galilei G.. Selected Works: In 2 t. -Moscow: "Science", 1964. T. 1.-571 p. (In Russian)

2. Sukhotin A.M. Alternative analysis principles: Study.-Tomsk: TPU Press, 2002.-43 p.

3. Fikhtengolts G. M. Course differential and integral calculus: In 3 t., 3-rd edit.- Moscow: "Science", 1967.-T. 2.-664 p. (In Russian)

Формулировка механики и электродинамики в пространстве октав как развитие программы геометризации физики

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Математической основой СТО является постулат пространства Минковского (А.Д. Александров. Хроногеометрия: 1968). Матрицы Паули изоморфны кватернионам (Дирак. Теория электрона). Алгебра октав не используется в физике (Ю.Б. Румер. Теория элементарных частиц: 1967). Алгебра октав содержит бинарно лиеву алгебру (А.И. Мальцев. Алгебраические системы: 1968). Пространство над алгеброй октав **O** допускает дифференциальную формулировку физики при вводе в качестве основных физических величин времени, трех пространственных координат, энергии, трех импульсных координат. Связь между смежными кватернионами в октаве физических величин (в предметном терме) и октаве соответствующих дифференциальных операторов (в операторном терме) осуществляется, по размерности, с помощью константы октетной физики m', [m'] = кг/с. Операторный терм октетной физики аналогичен образующим алгебры Гейзенберга. Результат перемножения операторного и предметного термов также принадлежит пространству **O** и отображается в 8-мерное евклидово пространство. В итоге получаем систему дифференциальных уравнений: