Advanced Studies in Theoretical Physics
Vol. 15, 2021, no. 6, 279 - 298
HIKARI Ltd, www.m-hikari.com
https://doi.org/10.12988/astp.2021.91655

About a Solution of $\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu} = M : \{M = 0, M > 0\}$ in Tensor Satisfying Binary Law

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Abstract

I handle the case that all coordinate systems satisfies Binary Law in this article. If all coordinate systems satisfies Binary Law, I have already reported that $\frac{\partial^3 x^\mu}{\partial x^\nu \partial x^\nu \partial x^\nu} = \frac{\partial x_\mu}{\partial x^\nu} = \left(\frac{\partial x_\nu}{\partial x_\nu} - x_\mu \frac{1}{2}\left(\frac{\partial g^{\nu\mu}}{\partial x^\nu}\right)\right) = M$ is established. I report it about the solution of the equation of $\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu} = M : \{M = 0, M > 0\}$ in this article. I report that these provided solutions can decide metric $g^{\mu\nu}$ of the space. Metric $g^{\mu\nu}$ of the space here is quantity of the filed. And I report that these solutions provided more can decide power F_μ. Power F_μ here is quantity of the filed.

Keywords: Tensor, Covariant Derivative

1 Introduction

If all coordinate systems satisfies Binary Law, I have already reported that $\frac{\partial^3 x^\mu}{\partial x^\nu \partial x^\nu \partial x^\nu} = \frac{\partial x_\mu}{\partial x^\nu} = \left(\frac{\partial x_\nu}{\partial x_\nu} - x_\mu \frac{1}{2}\left(\frac{\partial g^{\nu\mu}}{\partial x^\nu}\right)\right) = M$ is established.[2] I report it about the solution of the equation of $\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu} = M : \{M = 0, M > 0\}$ in this article. I report that two kinds of $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = -Mx^\nu$ and $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = \frac{M}{x^\nu}$ can rewrite equation $\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu} = M$ each. If $M = 0$ is established, I get $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = 0$ from $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = -Mx^\nu$, $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = \frac{M}{x^\nu}$. On the other hand, two kinds of $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = -Mx^\nu$, $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = \frac{M}{x^\nu}$ can exist if $M > 0$ is established.

2 Definition

Definition 1 *$\overline{x^\mu}\neq x^\mu, \overline{x^\nu}\neq x^\nu, \overline{x^\mu}=x^\nu, \overline{x^\nu}=x^\mu$ is established.[1]*
I named $\overline{x^\mu}\neq x^\mu, \overline{x^\nu}\neq x^\nu, \overline{x^\mu}=x^\nu, \overline{x^\nu}=x^\mu$ "Binary Law".[1]

Definition 2 *If $\overline{x^\mu}\neq x^\mu, \overline{x^\nu}\neq x^\nu, \overline{x^\mu}=x^\nu, \overline{x^\nu}=x^\mu$ is established, $x^\mu=x_\nu$ is established.[1]*

Definition 3 *If $\overline{x^\mu}\neq x^\mu, \overline{x^\nu}\neq x^\nu, \overline{x^\mu}=x^\nu, \overline{x^\nu}=x^\mu$ is established, $x^\nu=x_\mu$ is established.[1]*

Definition 4 *If $\overline{x^\mu}\neq x^\mu, \overline{x^\nu}\neq x^\nu, \overline{x^\mu}=x^\nu, \overline{x^\nu}=x^\mu$ is established, $x_\nu=-x_\mu$ is established.[1]*

Definition 5 *If $\overline{x^\mu}\neq x^\mu, \overline{x^\nu}\neq x^\nu, \overline{x^\mu}=x^\nu, \overline{x^\nu}=x^\mu$ is established, $x^\nu=-x^\mu$ is established.[1]*

Definition 6 *If $\overline{x^\mu}\neq x^\mu, \overline{x^\nu}\neq x^\nu, \overline{x^\mu}=x^\nu, \overline{x^\nu}=x^\mu$ is established, $\frac{\partial M}{\partial x^\mu}=0$ is established. "M" expresses $\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu}=M$.[2]*

Definition 7 *If $\overline{x^\mu}\neq x^\mu, \overline{x^\nu}\neq x^\nu, \overline{x^\mu}=x^\nu, \overline{x^\nu}=x^\mu$ is established, $\frac{\partial^3 x^\mu}{\partial x^\nu \partial x^\nu \partial x^\nu}=\frac{\partial x_\mu}{\partial x^\nu}=\frac{\partial x_\nu}{\partial x_\nu}-x_\mu\frac{1}{2}\left(\frac{\partial g^{\nu\mu}}{\partial x^\nu}\right)=M$ is established.[2]*

Definition 8 *$\delta=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$ is established for distance δ between two points of $P_1(x_1,y_1)$ and $P_2(x_2,y_2)$.[3]*

Definition 9 *Central (x_0,y_0), the equation of the circle of radius δ are expressed in $(x-x_0)^2+(y-y_0)^2=\delta^2$.[3]*

Definition 10 *$E=mc^2$ is established.[4]*
"E" expresses Energy, "m" expresses Mass, and "c" expresses Speed of light.

Definition 11 *$W(A\rightarrow B)=\int_A^B \vec{F}\cdot d\vec{r}$ is established.[5]*
"W" expresses Work, $\vec{F}$ expresses External force vector, and $\vec{r}$ expresses Displacement vector.

Definition 12 *$dx_i=\frac{\partial x'^j}{\partial x^i}dx'_j$ is established.*

Definition 13 *$ds^2=(\vec{e'^i}\cdot\vec{e'^j})dx'_i dx'_j=g^{ij}dx'_i dx'_j$ is established.[6]*

Definition 14 *$y(x) = C[2] + xC[1]$ is established as a solution of the equations of $\frac{d^2y}{dxdx} = 0$.[7]*
y is function y=f(x) which assumes x an independent variable.

Definition 15 *$y(x) = C[2]cos\left(\frac{\sqrt{M}x}{\sqrt{2}}\right) + C[1]sin\left(\frac{\sqrt{M}x}{\sqrt{2}}\right)$ is established as a solution of the equations of $\frac{d^2y}{dxdx} = -\frac{M*y}{2} : \{M > 0\}$.[7]*
y is function y=f(x) which assumes x an independent variable.

Hypothesis 1 *$M \propto m$, $M = \epsilon m$ is established.*
M expresses $\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu} = M$, ϵ expresses Proportional constant, and m expresses Mass.

3 About relations with solution of $\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu} = M : \{M = 0, M > 0\}$ and metric $g^{\mu\nu}$ of the space

Proposition 1 *When all coordinate systems satisfies Binary Law, $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = -Mx^\nu, \frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = \frac{M}{x^\nu}$ can rewrite $\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu} = M$.*

Proof: μ, ν-reverses Definition7 and gets

$$\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu} = M. \tag{1}$$

I get

$$\begin{aligned} \frac{\partial^3 \dot{x}^1}{\partial x^1 \partial x^1 \partial x^1} = M, \frac{\partial^3 \dot{x}^1}{\partial x^2 \partial x^2 \partial x^2} = M, \\ \frac{\partial^3 \dot{x}^2}{\partial x^1 \partial x^1 \partial x^1} = M, \frac{\partial^3 \dot{x}^2}{\partial x^2 \partial x^2 \partial x^2} = M \end{aligned} \tag{2}$$

from (1) if I assume a dimensional number 2. Furthermore, I get

$$\begin{aligned} \int \frac{\partial^3 \dot{x}^1}{\partial x^1 \partial x^1 \partial x^1} \partial x^1 = M \int \partial x^1, \int \frac{\partial^3 \dot{x}^1}{\partial x^2 \partial x^2 \partial x^2} \partial x^2 = M \int \partial x^2, \\ \int \frac{\partial^3 \dot{x}^2}{\partial x^1 \partial x^1 \partial x^1} \partial x^1 = M \int \partial x^1, \int \frac{\partial^3 \dot{x}^2}{\partial x^2 \partial x^2 \partial x^2} \partial x^2 = M \int \partial x^2 \end{aligned} \tag{3}$$

in consideration of Definition6 for (2). I get

$$\begin{aligned} \frac{\partial^2 \dot{x}^1}{\partial x^1 \partial x^1} = Mx^1, \frac{\partial^2 \dot{x}^1}{\partial x^2 \partial x^2} = Mx^2, \\ \frac{\partial^2 \dot{x}^2}{\partial x^1 \partial x^1} = Mx^1, \frac{\partial^2 \dot{x}^2}{\partial x^2 \partial x^2} = Mx^2 \end{aligned} \tag{4}$$

from (3). I get

$$\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = Mx^\mu \tag{5}$$

from (4). Two next

$$\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = -Mx^\nu, \tag{6}$$

$$\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = Mx_\nu = \frac{M}{x^\nu} \tag{7}$$

can rewrite (5) each using Definition2,Definition5. I get (7) as $x_\nu = \frac{1}{x^\nu}$ here.

– End Proof –

Proposition 2 *When all coordinate systems satisfies Binary Law,* $x^1 = x^2, \dot{x}^1 = \dot{x}^2$ *is established for* $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = -Mx^\nu, \frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = \frac{M}{x^\nu}$ *if the number of the dimensions is 2.*

Proof: I get

$$\frac{\partial^2 \dot{x}^1}{\partial x^1 \partial x^1} = -M\dot{x}^1, \frac{\partial^2 \dot{x}^1}{\partial x^2 \partial x^2} = -M\dot{x}^1,$$
$$\frac{\partial^2 \dot{x}^2}{\partial x^1 \partial x^1} = -M\dot{x}^2, \frac{\partial^2 \dot{x}^2}{\partial x^2 \partial x^2} = -M\dot{x}^2, \tag{8}$$

$$\frac{\partial^2 \dot{x}^1}{\partial x^1 \partial x^1} = \frac{M}{\dot{x}^1}, \frac{\partial^2 \dot{x}^1}{\partial x^2 \partial x^2} = \frac{M}{\dot{x}^1},$$
$$\frac{\partial^2 \dot{x}^2}{\partial x^1 \partial x^1} = \frac{M}{\dot{x}^2}, \frac{\partial^2 \dot{x}^2}{\partial x^2 \partial x^2} = \frac{M}{\dot{x}^2} \tag{9}$$

from (6),(7) if I assume a dimensional number 2. I get

$$\frac{\partial^2 \dot{x}^1}{\partial x^1 \partial x^1} = \frac{\partial^2 \dot{x}^1}{\partial x^2 \partial x^2}, \frac{\partial^2 \dot{x}^2}{\partial x^1 \partial x^1} = \frac{\partial^2 \dot{x}^2}{\partial x^2 \partial x^2} \tag{10}$$

from (8),(9). I get

$$\frac{\partial^2 \dot{x}^1}{\partial x^1 \partial x^1} = \frac{\partial^2 \dot{x}^1}{\partial x^1 \partial x^1} \quad (false), \frac{\partial^2 \dot{x}^2}{\partial x^1 \partial x^1} = \frac{\partial^2 \dot{x}^2}{\partial x^1 \partial x^1} \quad (false) \tag{11}$$

from (10) if I assume establishment of $x^1 = x^2 \quad (false)$. Because (11) isn't established,

$$x^1 = x^2 \tag{12}$$

is established. I get

$$\frac{d^2\dot{x}^1}{dx^1dx^1} = -M\dot{x}^1, \tag{13}$$
$$\frac{d^2\dot{x}^2}{dx^1dx^1} = -M\dot{x}^2, \tag{14}$$
$$\frac{d^2\dot{x}^1}{dx^1dx^1} = \frac{M}{\dot{x}^1}, \tag{15}$$
$$\frac{d^2\dot{x}^2}{dx^1dx^1} = \frac{M}{\dot{x}^2} \tag{16}$$

in consideration of (12) for (8),(9). I get

$$\frac{d^2\dot{x}^2}{dx^1dx^1} = -M\dot{x}^2 \quad (false), \frac{d^2\dot{x}^2}{dx^1dx^1} = \frac{M}{\dot{x}^2} \quad (false) \tag{17}$$

from (13),(15) if I assume establishment of $\dot{x}^1 = \dot{x}^2 \quad (false)$. I get

$$\frac{d^2\dot{x}^2}{dx^1dx^1} = \frac{d^2\dot{x}^2}{dx^1dx^1} \quad (false) \tag{18}$$

from (14),(16),(17). Because (18) isn't established,

$$\dot{x}^1 = \dot{x}^2 \tag{19}$$

is established. I get

$$\frac{d^2\dot{x}^1}{dx^1dx^1} = -M\dot{x}^1, \tag{20}$$
$$\frac{d^2\dot{x}^1}{dx^1dx^1} = \frac{M}{\dot{x}^1} \tag{21}$$

in consideration of (19) for (13),(14),(15),(16). I get

$$\delta = \sqrt{(x^1)^2 + (x^2)^2} \tag{22}$$

as $x_1 = 0, y_1 = 0, x_2 \rightarrow x^1, y_2 \rightarrow x^2$ for Definition8. I get

$$x^1 = \frac{\delta}{\sqrt{2}} \tag{23}$$

in consideration of (12) for (22). I rewrite (20),(21) in consideration of (23) and get

$$\frac{d^2\dot{x}^1}{d\delta d\delta} = -\frac{M\dot{x}^1}{2}, \tag{24}$$

$$\frac{d^2\dot{x}^1}{d\delta d\delta} = \frac{M}{2\dot{x}^1}. \tag{25}$$

– End Proof –

Proposition 3 *When all coordinate systems satisfies Binary Law, and* $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = -Mx^\nu, \frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = \frac{M}{x^\nu}$ *is established more,* $g^{11} = g^{12} = g^{21} = g^{22} = 2\frac{d\dot{x}^1}{dx^1}\frac{d\dot{x}^1}{dx^1}$: $g^{\mu\nu} = g^{11}, g^{12}, g^{21}, g^{22}$ *is established if a dimensional number is 2.*

Proof: If a dimensional number is 2,

$$d\vec{r} = dx_1\vec{e^1} + dx_2\vec{e^2}, \tag{26}$$

$$dx_1 = \frac{\partial x'^1}{\partial x^1}dx'_1 + \frac{\partial x'^2}{\partial x^1}dx'_2, dx_2 = \frac{\partial x'^1}{\partial x^2}dx'_1 + \frac{\partial x'^2}{\partial x^2}dx'_2 \tag{27}$$

is established. I considered Definition12 here. I get

$$\begin{aligned} ds^2 = d\vec{r}\cdot d\vec{r} &= (\vec{e^1}\cdot\vec{e^1})dx_1dx_1 + (\vec{e^1}\cdot\vec{e^2})dx_1dx_2 \\ &+(\vec{e^2}\cdot\vec{e^1})dx_2dx_1 + (\vec{e^2}\cdot\vec{e^2})dx_2dx_2 \\ &= dx_1dx_1 + dx_2dx_2 \end{aligned} \tag{28}$$

from (26). I selected it as $(\vec{e^1}\cdot\vec{e^1}) = (\vec{e^2}\cdot\vec{e^2}) = 1, (\vec{e^1}\cdot\vec{e^2}) = (\vec{e^2}\cdot\vec{e^1}) = 0$ here. I get

$$\begin{aligned} dx_1dx_1 &= \frac{\partial x'^1}{\partial x^1}\frac{\partial x'^1}{\partial x^1}dx'_1dx'_1 + \frac{\partial x'^2}{\partial x^1}\frac{\partial x'^1}{\partial x^1}dx'_2dx'_1 \\ &+\frac{\partial x'^1}{\partial x^1}\frac{\partial x'^2}{\partial x^1}dx'_1dx'_2 + \frac{\partial x'^2}{\partial x^1}\frac{\partial x'^2}{\partial x^1}dx'_2dx'_2, \\ dx_2dx_2 &= \frac{\partial x'^1}{\partial x^2}\frac{\partial x'^1}{\partial x^2}dx'_1dx'_1 + \frac{\partial x'^2}{\partial x^2}\frac{\partial x'^1}{\partial x^2}dx'_2dx'_1 \\ &+\frac{\partial x'^1}{\partial x^2}\frac{\partial x'^2}{\partial x^2}dx'_1dx'_2 + \frac{\partial x'^2}{\partial x^2}\frac{\partial x'^2}{\partial x^2}dx'_2dx'_2 \end{aligned} \tag{29}$$

from (27). I get

$$ds^2 = \left(\frac{\partial x'^1}{\partial x^1}\frac{\partial x'^1}{\partial x^1} + \frac{\partial x'^1}{\partial x^2}\frac{\partial x'^1}{\partial x^2}\right) dx'_1 dx'_1 + \left(\frac{\partial x'^2}{\partial x^1}\frac{\partial x'^1}{\partial x^1} + \frac{\partial x'^2}{\partial x^2}\frac{\partial x'^1}{\partial x^2}\right) dx'_2 dx'_1$$
$$+ \left(\frac{\partial x'^1}{\partial x^1}\frac{\partial x'^2}{\partial x^1} + \frac{\partial x'^1}{\partial x^2}\frac{\partial x'^2}{\partial x^2}\right) dx'_1 dx'_2 + \left(\frac{\partial x'^2}{\partial x^1}\frac{\partial x'^2}{\partial x^1} + \frac{\partial x'^2}{\partial x^2}\frac{\partial x'^2}{\partial x^2}\right) dx'_2 dx'_2$$
$$= g^{11} dx'_1 dx'_1 + g^{21} dx'_2 dx'_1 + g^{12} dx'_1 dx'_2 + g^{22} dx'_2 dx'_2 \quad (30)$$

from (28),(29),Definition13. I get

$$g^{11} = \frac{\partial \dot{x}^1}{\partial x^1}\frac{\partial \dot{x}^1}{\partial x^1} + \frac{\partial \dot{x}^1}{\partial x^2}\frac{\partial \dot{x}^1}{\partial x^2}, g^{21} = \frac{\partial \dot{x}^2}{\partial x^1}\frac{\partial \dot{x}^1}{\partial x^1} + \frac{\partial \dot{x}^2}{\partial x^2}\frac{\partial \dot{x}^1}{\partial x^2},$$
$$g^{12} = \frac{\partial \dot{x}^1}{\partial x^1}\frac{\partial \dot{x}^2}{\partial x^1} + \frac{\partial \dot{x}^1}{\partial x^2}\frac{\partial \dot{x}^2}{\partial x^2}, g^{22} = \frac{\partial \dot{x}^2}{\partial x^1}\frac{\partial \dot{x}^2}{\partial x^1} + \frac{\partial \dot{x}^2}{\partial x^2}\frac{\partial \dot{x}^2}{\partial x^2} \quad (31)$$

as $x'^1 \to \dot{x}^1, x'^2 \to \dot{x}^2$ for (30). I get

$$g^{11} = 2\frac{d\dot{x}^1}{dx^1}\frac{d\dot{x}^1}{dx^1}, g^{21} = 2\frac{d\dot{x}^2}{dx^1}\frac{d\dot{x}^1}{dx^1},$$
$$g^{12} = 2\frac{d\dot{x}^1}{dx^1}\frac{d\dot{x}^2}{dx^1}, g^{22} = 2\frac{d\dot{x}^2}{dx^1}\frac{d\dot{x}^2}{dx^1},$$
$$g^{11} = g^{12} = g^{21} = g^{22} = 2\frac{d\dot{x}^1}{dx^1}\frac{d\dot{x}^1}{dx^1} \quad (32)$$

from (12),(19) in consideration of Proposition2 for (31). I rewrite (32) in consideration of (23) and get

$$g^{11} = g^{12} = g^{21} = g^{22} = 4\frac{d\dot{x}^1}{d\delta}\frac{d\dot{x}^1}{d\delta}. \quad (33)$$

– End Proof –

Proposition 4 *When all coordinate systems satisfies Binary Law, and* $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = -Mx^\nu, \frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu} = \frac{M}{x^\nu}$ *is established more,* $M = M' - \frac{4}{\dot{x}^1}\frac{d^2\dot{x}^1}{dx^1 dx^1}, F'_1 = -\frac{8\sqrt{2}}{(\dot{x}^1)^2}\frac{d\dot{x}^1}{d\delta}\frac{d^2\dot{x}^1}{d\delta d\delta} + \frac{8\sqrt{2}}{\dot{x}^1}\frac{d^3\dot{x}^1}{d\delta d\delta d\delta}$ *is established if a dimensional number is 2.*

Proof: μ, ν-reverses Definition7 and gets

$$M = \frac{\partial x_\mu}{\partial x_\mu} - x_\nu \frac{1}{2}\left(\frac{\partial g^{\mu\nu}}{\partial x^\mu}\right). \quad (34)$$

If the second term of the right side of (34) is zero, I get

$$M = \frac{\partial x_\mu}{\partial x_\mu}. \tag{35}$$

"M" in (34),(35) is the same each. Therefore, I express (35) in

$$M' = \frac{\partial x_\mu}{\partial x_\mu} \tag{36}$$

to distinguish these. I get

$$M = M' - x_\nu \frac{1}{2}\left(\frac{\partial g^{\mu\nu}}{\partial x^\mu}\right) \tag{37}$$

from (34),(36). I get

$$\begin{aligned} M = M' - \dot{x}_1 \frac{1}{2}\left(\frac{\partial g^{11}}{\partial x^1}\right) - \dot{x}_1 \frac{1}{2}\left(\frac{\partial g^{12}}{\partial x^2}\right) \\ - \dot{x}_2 \frac{1}{2}\left(\frac{\partial g^{21}}{\partial x^1}\right) - \dot{x}_2 \frac{1}{2}\left(\frac{\partial g^{22}}{\partial x^2}\right) \end{aligned} \tag{38}$$

from (37) if I assume a dimensional number 2. I get

$$\begin{aligned} M = M' - \frac{1}{\dot{x}^1}\frac{1}{2}\left(\frac{\partial g^{11}}{\partial x^1}\right) - \frac{1}{\dot{x}^1}\frac{1}{2}\left(\frac{\partial g^{12}}{\partial x^2}\right) \\ - \frac{1}{\dot{x}^2}\frac{1}{2}\left(\frac{\partial g^{21}}{\partial x^1}\right) - \frac{1}{\dot{x}^2}\frac{1}{2}\left(\frac{\partial g^{22}}{\partial x^2}\right) \end{aligned} \tag{39}$$

as $\dot{x}_1 = \frac{1}{\dot{x}^1}, \dot{x}_2 = \frac{1}{\dot{x}^2}$ for (38). I get

$$\begin{aligned} M = M' - \frac{2}{\dot{x}^1}\left(\frac{dg^{11}}{dx^1}\right) \\ = M' - \frac{4}{\dot{x}^1}\left(\frac{d\frac{d\dot{x}^1}{dx^1}\frac{d\dot{x}^1}{dx^1}}{dx^1}\right) = M' - \frac{8}{\dot{x}^1}\frac{d^2\dot{x}^1}{dx^1 dx^1}\frac{d\dot{x}^1}{dx^1}, \\ M' = M + \frac{8}{\dot{x}^1}\frac{d^2\dot{x}^1}{dx^1 dx^1}\frac{d\dot{x}^1}{dx^1} \end{aligned} \tag{40}$$

from (12),(19),(32) in consideration of Proposition2,Proposition3 for (39). I rewrite (40) in consideration of (23) and get

$$M' = M + \frac{16\sqrt{2}}{\dot{x}^1}\frac{d^2\dot{x}^1}{d\delta d\delta}\frac{d\dot{x}^1}{d\delta}. \tag{41}$$

I rewrite Definition11 and can get

$$W = \int \vec{F} \cdot d\vec{r} = \int F_\mu \partial r^\mu = \int F^\mu \partial r_\mu,$$
$$E = \int F_\mu \partial x^\mu = \int F^\mu \partial x_\mu. \tag{42}$$

I get (42) as $W \rightarrow E, r^\mu \rightarrow x^\mu, r_\mu \rightarrow x_\mu$ here. I get

$$F_\mu = \frac{\partial E}{\partial x^\mu}, \tag{43}$$
$$F^\mu = \frac{\partial E}{\partial x_\mu} \tag{44}$$

from (42). I get

$$F_\mu = \frac{\partial \frac{M}{\epsilon} c^2}{\partial x^\mu} = \frac{\partial M}{\partial x^\mu} \tag{45}$$

as $c = 1, \epsilon = 1$ from (43),Definition10,Hypothesis1.

$$F_\mu = \frac{\partial M}{\partial x^\mu} = 0 \tag{46}$$

is established in consideration of Definition6 in (45). I get

$$F_1 = \frac{\partial M}{\partial x^1} = 0, F_2 = \frac{\partial M}{\partial x^2} = 0 \tag{47}$$

from (46) if I assume a dimensional number 2. I get

$$F_1 = F_2 = \frac{dM}{dx^1} = 0 \tag{48}$$

from (12) in consideration of Proposition2 for (47). I get

$$\frac{dM'}{dx^1} = \frac{dM}{dx^1} + \frac{d \frac{8}{\dot{x}^1} \frac{d^2\dot{x}^1}{dx^1 dx^1} \frac{d\dot{x}^1}{dx^1}}{dx^1} = \frac{d \frac{8}{\dot{x}^1} \frac{d^2\dot{x}^1}{dx^1 dx^1} \frac{d\dot{x}^1}{dx^1}}{dx^1} = F_1',$$
$$F_1' = -\frac{8}{(\dot{x}^1)^2} \frac{d\dot{x}^1}{dx^1} \frac{d^2\dot{x}^1}{dx^1 dx^1} \frac{d\dot{x}^1}{dx^1} + \frac{8}{\dot{x}^1} \frac{d^3\dot{x}^1}{dx^1 dx^1 dx^1} \frac{d\dot{x}^1}{dx^1} + \frac{8}{\dot{x}^1} \frac{d^2\dot{x}^1}{dx^1 dx^1} \frac{d^2\dot{x}^1}{dx^1 dx^1} \tag{49}$$

from (40),(48). I rewrite (49) in consideration of (23) and get

$$F_1' = -\frac{32}{(\dot{x}^1)^2} \frac{d\dot{x}^1}{d\delta} \frac{d^2\dot{x}^1}{d\delta d\delta} \frac{d\dot{x}^1}{d\delta} + \frac{32}{\dot{x}^1} \frac{d^3\dot{x}^1}{d\delta d\delta d\delta} \frac{d\dot{x}^1}{d\delta} + \frac{32}{\dot{x}^1} \frac{d^2\dot{x}^1}{d\delta d\delta} \frac{d^2\dot{x}^1}{d\delta d\delta}. \tag{50}$$

– End Proof –

Proposition 5 *When all coordinate systems satisfies Binary Law,* $g^{11}=2\sqrt{2}C_\delta, F_1'=0$ *is established for* $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu}=-Mx^\nu, \frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu}=\frac{M}{x^\nu}:M=0$ *if the number of the dimensions is 2.*

Proof: When $M=0$ is established, I get

$$\frac{d^2\dot{x}^1}{d\delta d\delta}=0 \tag{51}$$

from (24),(25). I get

$$\dot{x}^1=f(\delta)=C_\delta[2]+\delta C_\delta[1] \tag{52}$$

as a solution of the equations of (51) in consideration of Definition14. C_δ expresses a constant term for variable δ here. I get

$$\dot{x}^1=f(\delta)=\delta C_\delta[1]=\delta C_\delta \tag{53}$$

as $C_\delta[2]=0$ for (52). I get

$$\frac{d\dot{x}^1}{d\delta}=C_\delta, \frac{d^2\dot{x}^1}{d\delta d\delta}=0, \frac{d^3\dot{x}^1}{d\delta d\delta d\delta}=0 \tag{54}$$

from (53). I get

$$g^{11}=g^{12}=g^{21}=g^{22}=4\left(C_\delta\right)^2 \tag{55}$$

from (33),(54). I get

$$F_1'=0 \tag{56}$$

from (50),(53),(54).

– End Proof –

Proposition 6 *When all coordinate systems satisfies Binary Law,* $g^{11}=2M\left(C_\delta cos\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right)\right)^2, F_1'=8M^2C_\delta sin\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right), g^{11}=4\frac{dh(\delta)}{d\delta}\frac{dh(\delta)}{d\delta}, F_1'=-\frac{32}{(h(\delta))^2}\frac{dh(\delta)}{d\delta}\frac{d^2h(\delta)}{d\delta d\delta}\frac{dh(\delta)}{d\delta}+\frac{32}{h(\delta)}\frac{d^3h(\delta)}{d\delta d\delta d\delta}\frac{dh(\delta)}{d\delta}+\frac{32}{h(\delta)}\frac{d^2h(\delta)}{d\delta d\delta}\frac{d^2h(\delta)}{d\delta d\delta}$ *is established for* $\frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu}=-Mx^\nu, \frac{\partial^2 x^\nu}{\partial x^\mu \partial x^\mu}=\frac{M}{x^\nu}:M>0$ *if the number of the dimensions is 2.*

Proof: When $M > 0$ is established, I get

$$\dot{x}^1 = g(\delta) = C_\delta[2]cos\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) + C_\delta[1]sin\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) \tag{57}$$

as a solution of the equations of (24) in consideration of Definition15. I get

$$\dot{x}^1 = g(\delta) = C_\delta[1]sin\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) = C_\delta sin\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) \tag{58}$$

as $C_\delta[2] = 0$ for (57). I get

$$\frac{d\dot{x}^1}{d\delta} = \frac{\sqrt{M}}{\sqrt{2}}C_\delta cos\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right), \frac{d^2\dot{x}^1}{d\delta d\delta} = -\frac{M}{2}C_\delta sin\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right),$$
$$\frac{d^3\dot{x}^1}{d\delta d\delta d\delta} = -\frac{M}{2}\frac{\sqrt{M}}{\sqrt{2}}C_\delta cos\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) \tag{59}$$

from (58). I get

$$g^{11} = g^{12} = g^{21} = g^{22} = 2M\left(C_\delta cos\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right)\right)^2 \tag{60}$$

from (33),(59). I get

$$\begin{aligned} F_1' = 8M^2 cot\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) C_\delta cos\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) \\ -8M^2 cot\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) C_\delta cos\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) \\ +8M^2 C_\delta sin\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) \\ = 8M^2 C_\delta sin\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) \end{aligned} \tag{61}$$

from (50),(58),(59). I show details form about (61) to Fig.1. I get

$$0 = F_1' = 8M^2 C_\delta sin\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) = 8M^2 C_\delta sin(\pi n) \tag{62}$$

from (61).

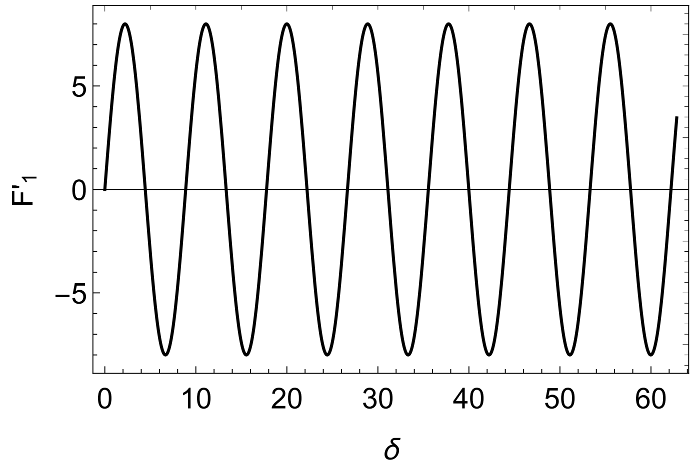

Figure 1: $(F_1' - \delta) : F_1' = 8M^2C_\delta sin\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right)$ for $\frac{d^2\dot{x}^1}{dx^1dx^1} = -M\dot{x}^1$: $\{M = 1, C_\delta = 1\}$.[8]

When (62) is established,

$$\delta = \sqrt{2}\pi n \tag{63}$$

is established. I assumed it $M = 1$ here. δ when $F_1' = 0$ is satisfied is

$$\delta = 0, \sqrt{2}\pi, 2\sqrt{2}\pi, 3\sqrt{2}\pi, 4\sqrt{2}\pi, 5\sqrt{2}\pi, \cdots \tag{64}$$

from (63). I show details form about Central $(0, 0)$, the equation of the circle of radius δ in consideration of Definition9 to Fig.2. I assumed it δ according to (64) here. $F_1' \neq 0$ is established any place other than the domain of δ according to (64). I get

$$0 = F_1' = 8M^2C_\delta sin\left(\frac{\sqrt{M}\delta}{\sqrt{2}}\right) = 8M^2C_\delta sin\left(2\pi\right) \tag{65}$$

from (61). When (65) is established,

$$\delta = \frac{2\pi\sqrt{2}}{\sqrt{M}} \tag{66}$$

is established. δ of (66) accords in wavelength λ of (61).

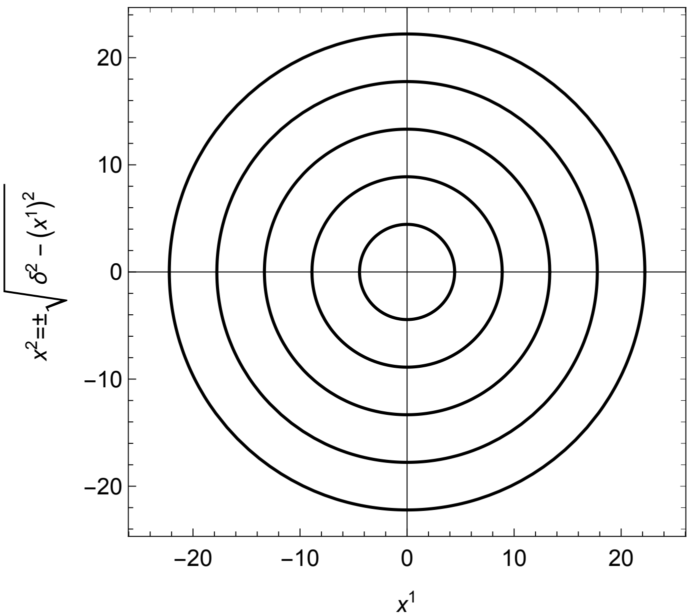

Figure 2: $(x^2 - x^1) : x^2 = \pm\sqrt{\delta^2 - (x^1)^2}$ details form about Central $(0, 0)$, the equation of the circle of radius $\delta = \sqrt{2}\pi, 2\sqrt{2}\pi, 3\sqrt{2}\pi, 4\sqrt{2}\pi, 5\sqrt{2}\pi$.[8]

Therefore, I get

$$\lambda = \frac{2\pi\sqrt{2}}{\sqrt{M}} \tag{67}$$

from (66).

When $M > 0$ is established, I get

$$\dot{x}^1 = h(\delta) \tag{68}$$

as a solution of the equations of (25). I show details form by the numerical computation about (68) to Fig.3. I get

$$g^{11} = g^{12} = g^{21} = g^{22} = 4\frac{dh(\delta)}{d\delta}\frac{dh(\delta)}{d\delta} \tag{69}$$

from (33),(68). I show details form by the numerical computation about (69) to Fig.4.

I get

$$M' = M + \frac{16\sqrt{2}}{h(\delta)}\frac{d^2 h(\delta)}{d\delta d\delta}\frac{dh(\delta)}{d\delta} \tag{70}$$

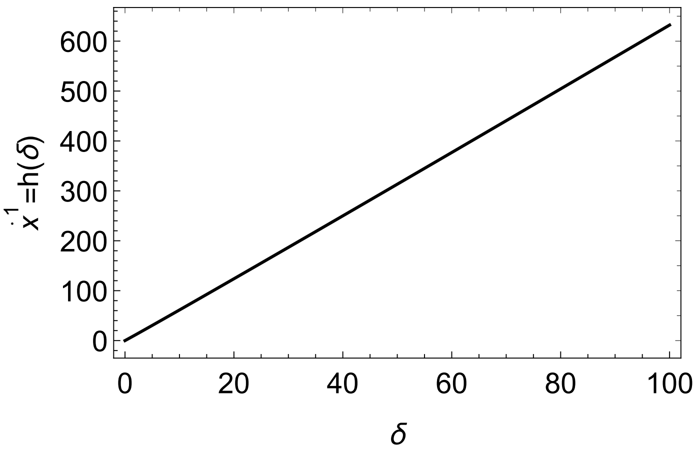

Figure 3: $(\dot{x}^1 - \delta) : \dot{x}^1 = h(\delta)$ numerical computation plot for $\frac{d^2\dot{x}^1}{dx^1dx^1} = \frac{M}{\dot{x}^1}$: $\{M = 1\}$.[8]

from (41),(68). I get

$$F_1' = -\frac{32}{(h(\delta))^2}\frac{dh(\delta)}{d\delta}\frac{d^2h(\delta)}{d\delta d\delta}\frac{dh(\delta)}{d\delta} + \frac{32}{h(\delta)}\frac{d^3h(\delta)}{d\delta d\delta d\delta}\frac{dh(\delta)}{d\delta} + \frac{32}{h(\delta)}\frac{d^2h(\delta)}{d\delta d\delta}\frac{d^2h(\delta)}{d\delta d\delta} \quad (71)$$

from (50),(68). I show details form by the numerical computation about (70),(71) to Fig.5,Fig.6.

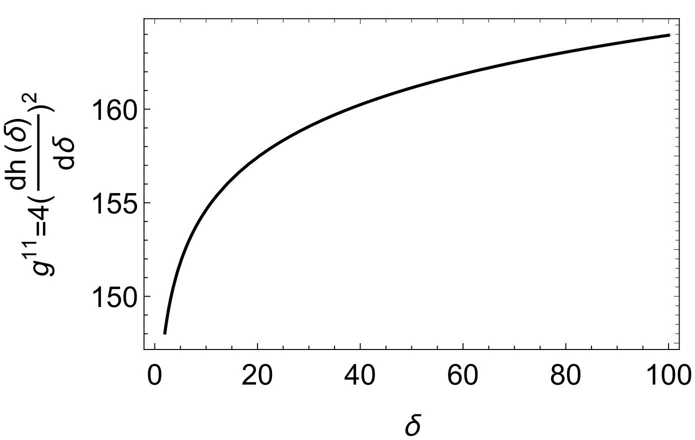

Figure 4: $(g^{11} - \delta) : g^{11} = 4\left(\frac{dh(\delta)}{d\delta}\right)^2$ numerical computation plot for $\frac{d^2\dot{x}^1}{dx^1dx^1} = \frac{M}{\dot{x}^1}$: $\{M = 1\}$.[8]

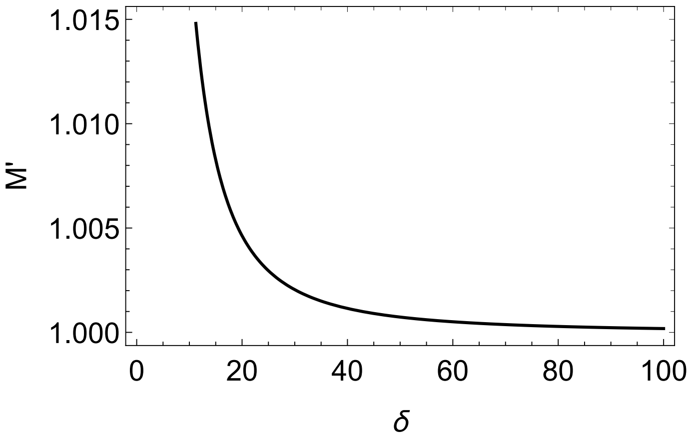

Figure 5: $(M' - \delta) : M' = M + \frac{16\sqrt{2}}{h(\delta)} \frac{d^2 h(\delta)}{d\delta d\delta} \frac{dh(\delta)}{d\delta}$ numerical computation plot for $\frac{d^2 \dot{x}^1}{dx^1 dx^1} = \frac{M}{\dot{x}^1} : \{M = 1\}$.[8]

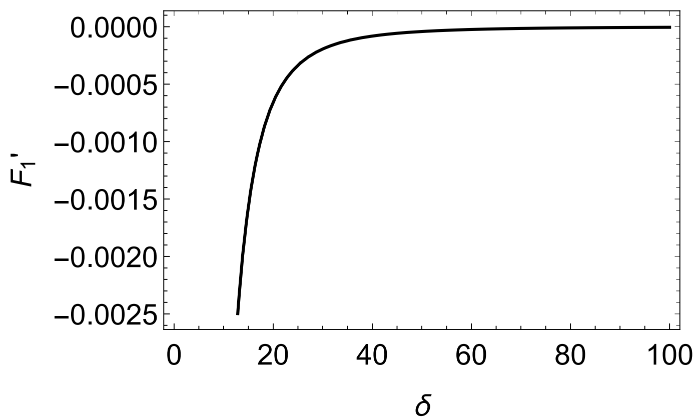

Figure 6: $(F_1' - \delta) : F_1' = -\frac{32}{(h(\delta))^2} \frac{dh(\delta)}{d\delta} \frac{d^2 h(\delta)}{d\delta d\delta} \frac{dh(\delta)}{d\delta} + \frac{32}{h(\delta)} \frac{d^3 h(\delta)}{d\delta d\delta d\delta} \frac{dh(\delta)}{d\delta} + \frac{32}{h(\delta)} \frac{d^2 h(\delta)}{d\delta d\delta} \frac{d^2 h(\delta)}{d\delta d\delta}$ numerical computation plot for $\frac{d^2 \dot{x}^1}{dx^1 dx^1} = \frac{M}{\dot{x}^1} : \{M = 1\}$.[8]

– End Proof –

4 About outbreak mechanism of the gravitation to occur between two matter

I show details form about Central $(0, 0)$, the equation of the circle of radius $\delta = 1$ in consideration of Definition9 to Fig.7. I get Fig.8 in consideration of

Fig.6 for Fig.7.

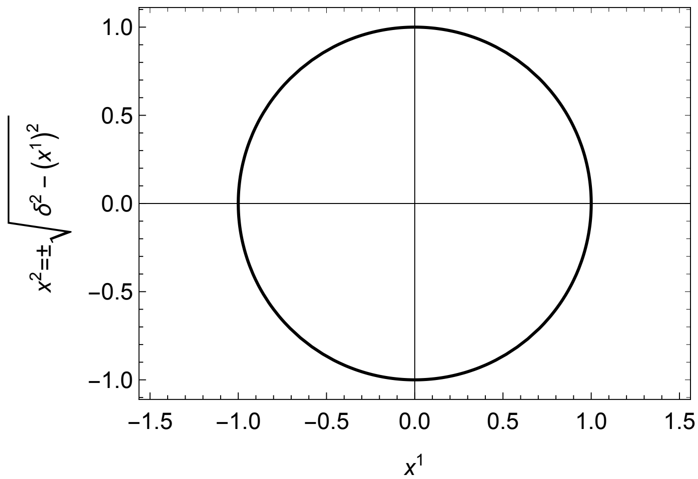

Figure 7: $(x^2 - x^1) : x^2 = \pm\sqrt{\delta^2 - (x^1)^2}$ details form about Central $(0, 0)$, the equation of the circle of radius $\delta = 1$.[8]

The arrow of Fig.8 expresses Vector field $\vec{F'_\mu}(\delta) : (F'_1(\delta), F'_2(\delta)) = (F'_1(\delta), F'_1(\delta))$ in Fig.6.
All $|\vec{F'_\mu}(\delta)| = \sqrt{(F'_1(\delta))^2 + (F'_2(\delta))^2} = \sqrt{2}F'_1(\delta)$ of Vector field $\vec{F'_\mu}(\delta)$ showed it to equivalence. $F'_1 = F'_2$ is established from (48) here. Because I don't consider it in this article about the change for δ of $|\vec{F'_\mu}(\delta)|$, I express it as $|\vec{F'_\mu}(\delta)| = C_\delta$ in Fig.8. C_δ expresses invariable for variable δ.

Area $\alpha : (\delta > 0)$ is compressed equally if I switch from point $\alpha : (\delta = 0)$ to area of the circle α of radius $\delta > 0$ in Fig.8. However, the power to move area $\alpha : (\delta > 0)$ to a particular direction on two dimensions doesn't occur. In other words, area $\alpha : (\delta > 0)$ is only compressed equally.

If $|\vec{F'_\mu}(\delta)|$ of field of force $\vec{F'_\mu}(\delta) : \{1, 2\}$ is reduced in Fig.8 here, the power of the direction of field of force $\vec{F'_\mu}(\delta) : \{3, 4\}$ will appear for area $\alpha : (\delta > 0)$. In other words, a symmetric break of field of force $\vec{F'_\mu}(\delta)$ in Fig.8 causes power to move area $\alpha : (\delta > 0)$ to a particular direction. The power to appear grows big so that a symmetric break is big.

I think about the case that point α producing field of force $\vec{F'_\mu}(\delta)$ exists one more in this neighborhood. I express another point in β here. I get Fig.9 as $(-320 < x^1 < 320) \rightarrow (-250 < x^1 < 650), (-320 < x^2 < 320) \rightarrow (-250 < x^2 < 650)$ in Fig.8. I get Fig.10 as point $\alpha : (0, 0) \rightarrow \alpha : (400, 400)$, $\alpha : (400, 400) \rightarrow \beta : (400, 400)$ in Fig.9. I superimpose Fig.10 on Fig.9 and get

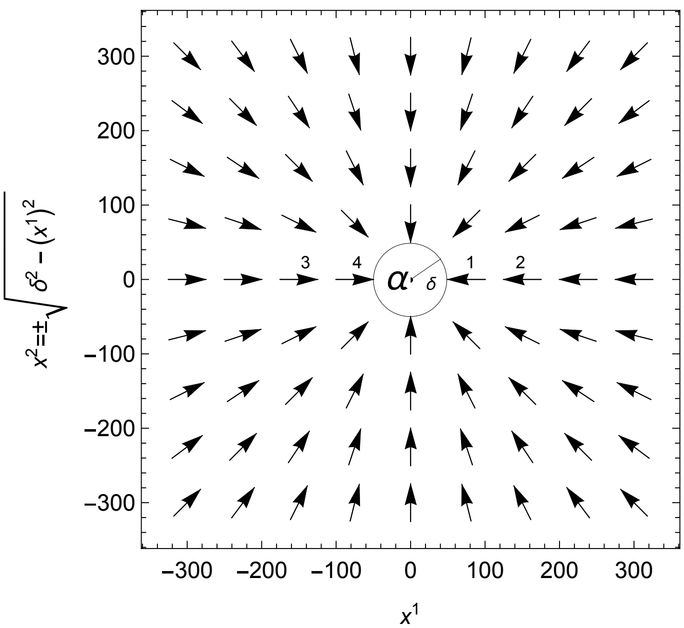

Figure 8: Vector field $\vec{F}'_\mu(\delta) : (F'_1(\delta), F'_2(\delta)) = (F'_1(\delta), F'_1(\delta))$ for point α : $(\delta = 0)$.[8]

Fig.11. Then, I show that field of force $\vec{F}'_\mu(\delta)$ by point β breaks a symmetry of field of force $\vec{F}'_\mu(\delta)$ by point α. Furthermore, I show that field of force $\vec{F}'_\mu(\delta)$ by point α breaks a symmetry of field of force $\vec{F}'_\mu(\delta)$ by point β. The direction of field of force $\vec{F}'_\mu(\delta) : \{3, 4, 5\}$ of Fig.10 is reverse to field of force $\vec{F}'_\mu(\delta) : \{3, 4, 5\}$ of Fig.9. Therefore, $|\vec{F}'_\mu(\delta)|$ of field of force $\vec{F}'_\mu(\delta) : \{3, 4, 5\}$ is reduced in Fig.11. Thus, field of force $\vec{F}'_\mu(\delta) : \{1, 2\}$ appears for point α, and field of force $\vec{F}'_\mu(\delta) : \{6, 7\}$ appears for point β. There seems to be power to attract each other between point α and point β.

5 Discussion

Because $F'_1(\delta) = 0$ is established in the case of $M = 0$ in Proposition5, it is $\vec{F}'_\mu(\delta) : (F'_1(\delta), F'_1(\delta)) = (0, 0)$. In the case of $M > 0$, $F'_1(\delta) : Fig.1$ and $F'_1(\delta) : Fig.6$ are established together in Proposition6. Because size of the wavelength of $F'_1(\delta) : Fig.1$ is limited numerical value, we don't need to consider existence of $F'_1(\delta) : Fig.1$ on the scale to greatly exceed size of the wavelength.

About $\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu} = M$

When Binary Law is established, all coordinate systems is only two of x^μ, x^ν.[1]

I get $\frac{\partial^3 x^\mu}{\partial x^\nu \partial x^\nu \partial x^\nu} = M$ as μ, ν-inversion form of $\frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu} = M$. Because

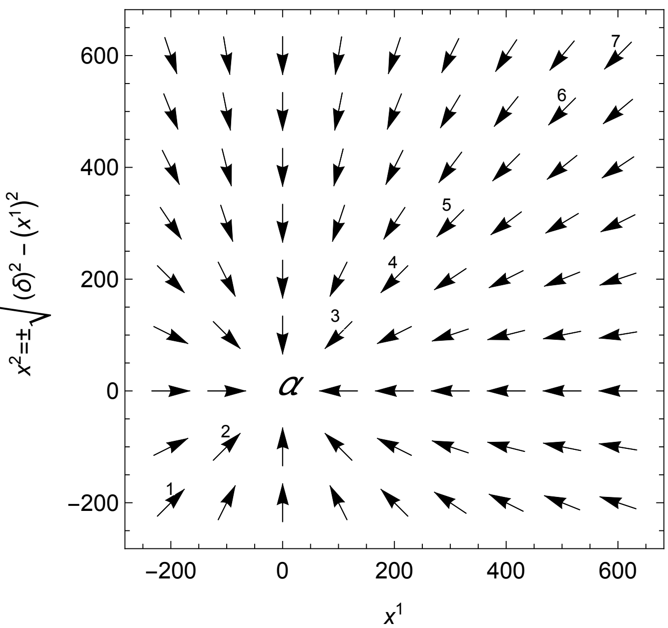

Figure 9: Vector field $\vec{F}'_{\mu}(\delta) : (F'_1(\delta), F'_2(\delta)) = (F'_1(\delta), F'_1(\delta))$ for point α : $(\delta = 0)$.[8]

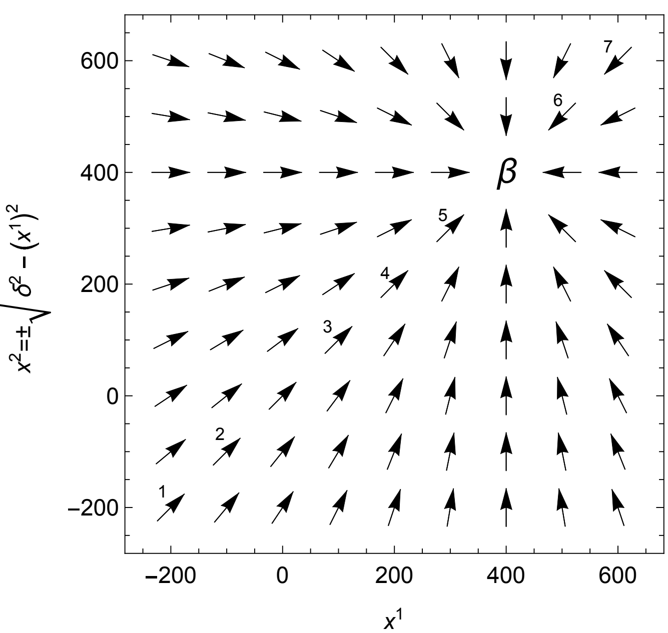

Figure 10: Vector field $\vec{F}'_{\mu}(\delta) : (F'_1(\delta), F'_2(\delta)) = (F'_1(\delta), F'_1(\delta))$ for point β : $(\delta = 0)$.[8]

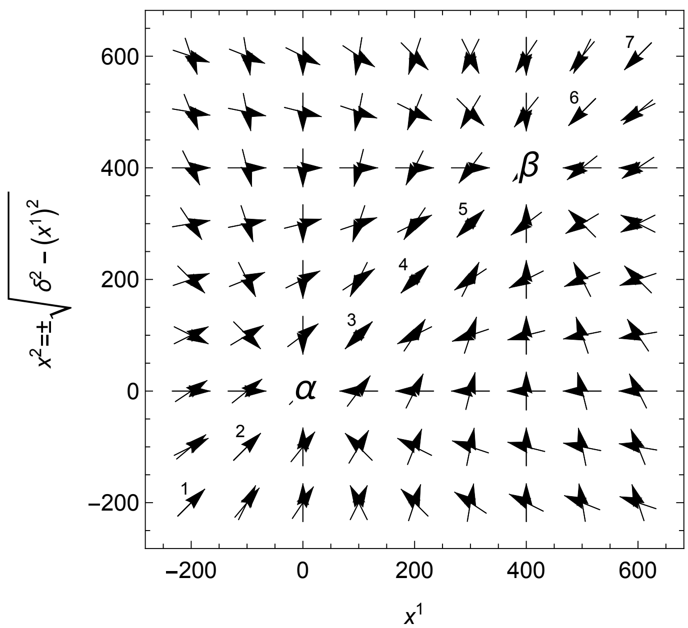

Figure 11: Vector field $\vec{F}'_\mu(\delta) : (F'_1(\delta), F'_2(\delta)) = (F'_1(\delta), F'_1(\delta))$ for point $\alpha : (\delta = 0), \beta : (\delta = 0)$.[8]

$\frac{\partial^3 x^\mu}{\partial x^\nu \partial x^\nu \partial x^\nu}, \frac{\partial^3 x^\nu}{\partial x^\mu \partial x^\mu \partial x^\mu}$ became the scalar each, it was found that all coordinate systems x^μ, x^ν obeyed these differential equations mathematically each. It wasn't known that all coordinate systems could have such a property in the past. This is a new discovery fact and is discovery in tensor satisfying Binary Law. M to show here is scalar. Therefore, all coordinate systems x^μ, x^ν can adopt three states based on $\{M = 0, M > 0, M < 0\}$ each.

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[7] Calculation result obtained by the author using Mathematica 11.3J Home Edition.

[8] Figure obtained by the author by Mathematica 11.3J Home Edition.

Received: July 27, 2021; Published: August 11, 2021