Road to Star Ocean

－This is the latest version.－

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Contents

◆Chapter 1: Possibility of super lightspeed flight
(special theory of relativity and my theory on the space)

◇Minus-world and imaginary number

$$m' = \frac{m}{\sqrt{1-\frac{v^2}{c^2}}} \quad 【1】$$

According to the special theory of relativity, 【1】 is formed. It is said the fact that inside in the root number of 【1】 becomes minus and makes a imaginary number when v becomes bigger than the velocity of light c is one of the bases which make the super lightspeed flight impossible. Because imaginary numbers cannot exist.

Is an imaginary number actually a number which cannot exist? First, I think about so-called real numbers. Real numbers are based on matter in our world. Therefore, supposing that matter is positive, all real numbers are positive, too. Then, I think about minus numbers -1 and so on. They are nothing but numbers you put minus marks on real numbers for your calculations. Resultingly, the real numbers, both plus numbers and minus numbers are all positive numbers based on matter.

Well, what are negative numbers against the real numbers which are positive? I think they are imaginary numbers. Imaginary numbers are the numbers which become positive when squared. In our positive number world, all numbers become positive when squared. However, it is logical to suppose all numbers in a negative number world become negative when squared. In the negative number world, the imaginary numbers do exist and become the real numbers in the negative number world. The imaginary numbers are essentially negative numbers.

Well, does the negative number world exist? As basis to support the existence of the negative numbers, antigravitational matter can be thought of, whose repulsion works to matter (There is a possibility that so-called antimatter such as antiproton is antigravitational matter). Electric force and magnetic force have attraction and repulsion. Gravitation acts between matter and matter. Equally gravitation acts between antigravitational matter and antigravitational matter. Therefore, I think repulsion acts between matter and antigravitational matter. I think the world of this antigravitational matter is the negative number world. In our world, the antigravitational matter is not found, because the repulsion worked in the process of space forming and the antigravitational matter has formed its unique world apart from our matter world. And, there is no basis to deny that this negative number world was generated in the process of space forming and the very existence of the antigravitational matter world makes it possible to think the whole world is symmetrical. As long as the structure of the space is pending, I think such assumption is not forbidden.

I try to consider the history of the space from the relation between matter and antigravitational matter. At the beginning of the space, matter and antigravitational matter were in minimal space. In this space, the repulsion which acted between matter and antigravitational matter was extremely strong, worked as an unstabilizing factor, and made very big power to expand space. From this, inflationary space is explicable. Then it is unnecessary to consider that the negative pressure occurred in the space of supercooling condition and resulted in the inflation.

When the expansion of the space has moved ahead, matter and antigravitational matter were scattered into each unique spaces. And as they existed in the maximal space, the repulsion and the gravitation intersected and worked as a stabilizing factor. Hereinafter, I call our world of matter "Plus-world" and call the world of antigravitational matter "Minus-world".

$$m' = \frac{m}{\sqrt{\frac{v^2}{c^2} - 1}} \times \frac{1}{i} \quad 【2】 \qquad\qquad t' = t\,i\sqrt{\frac{v^2}{c^2} - 1} \quad 【3】$$

If imaginary numbers are real numbers in Minus-world, what do 【2】 and 【3】 in "$v>c$" mean? 【2】 is a formula about matter. But it is difficult to think matter converts into antigravitational matter. And matter follows the nature of its peculiar time and space. Therefore, 【2】 means the existence of matter in Minus-world. In other words, at super lightspeed, matter can shift into Minus-world. 【3】 means time in Minus-world passes on the matter of super lightspeed in the negative world.

Incidentally, *Dr. Hawking* admit imaginary time. As long as physics is the science which handles existence, it means imaginary numbers do exist. Also, if the existence of *Einstein*'s space clause is admitted, I think it means the existence of the repulsion of antigravitational matter in Minus-world.

◇**Rush into Minus-world**

In Minus-world, super lightspeed flight becomes possible. Well, by what means can you rush into Minus-world? They think there is a wall that our mass becomes infinite when our speed approaches the velocity of light.

$$\int \frac{dx}{\sqrt{a^2 - x^2}} = Sin^{-1}\frac{x}{a} + C \qquad 【4】$$

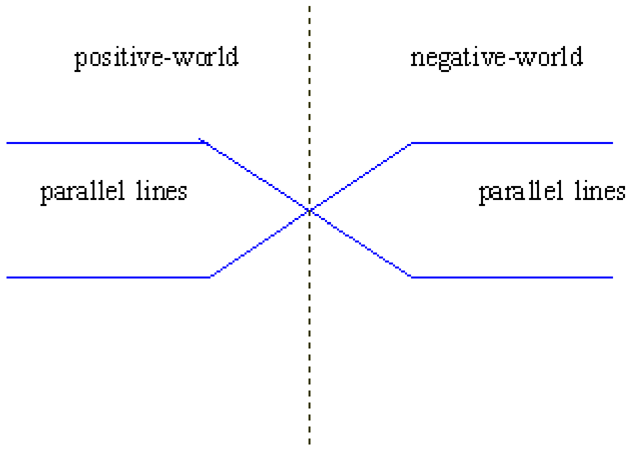
$$\begin{aligned} Ft &= \int_0^c m' \, dv \\ &= \int_0^c \frac{m}{\sqrt{1-\frac{v^2}{c^2}}} dv \\ &= mc\int_0^c \frac{dv}{\sqrt{c^2 - v^2}} \qquad 【5】 \\ &= mc\left[Sin^{-1}\frac{x}{c} \right]_0^c \\ &= \frac{\pi}{2} mc \end{aligned}$$

However, I discovered 【1】 can be integrated by the speed at the section from *0* to *c*. Since there is a formula 【4】, 【5】 is available. This integration has a definite answer, and that means infinite mass can be realized by giving the mass definite impulse (*force × time*) of *πmc/2*. By this, I think the wall of infinite mass is cleared.

Suppose speed of a spaceship approaches lightspeed and mass of the spaceship becomes infinite by giving impulse. You can think increased mass is used for rushing into Minus-world because mass is equivalent to energy. It is possible to think you can go to another world by using infinite energy, too. Also, by Lorentz's shrinkage, it is possible to think that our size becomes 0 and passes through the wall between two worlds.

I try to think about this from the structure of our world. The structure of our world is pending. But, it is clear that the space can have warps according to the theory of relativity and so on. I think our world is non- Euclid where parallel lines cross. From macroscopic point of view the Newtonian dynamics is applicable, while from microscopic point of view the quantum mechanics is applicable. On the other hand, Euclidean geometry is applicable in human size world, while non-Euclidean geometry is applicable in space size world. Then, destination where crossed parallel lines go to is Minus-world. You can think it means spaceships rush into Minus-world when they advance straight in this way. Cf. Figure 1

Figure 1



Then, if supposing space is warped, a spaceship in deep space does not go straight if it moves with uniform velocity. You need to give force to make it go straight. For this purpose, you should give the impulse of $\pi mc/2$.

What relation do Minus-world and Plus-world have? Since Minus-world is the world of antigravitational matter and symmetrical world to Plus-world, it can be sufficiently thought of that Minus-world is the world of shadow against the positive world. The world of shadow is assumed by superstring theory, too.

◆Chapter 2: G which acts on spaceships (general theory of relativity and spaceships)

◇What is G(load)?

Contents in this chapter are acquired by my unique thinking like other contents. I read books on the theory of relativity. But I have not seen the same point of an argument about general theory of relativity and acceleration of spaceships.

Even if you can give a spaceship big impulse by a new revolutionary engine and the impulse gives it big G, human beings in the spaceship cannot endure the G and the limit of acceleration arises, which can be a big problem. I agree the essence of gravitation is accelerated motion as well as the essence of spaceships' motions. However, when force which spreads through human beings from their spaceship increases gradually and the human beings and their spaceship move at the same accelerated velocity, I think the human beings can move freely, which are explained below.

When a rocket is launched, astronauts experience big *G (load)*. I think this phenomenon occurs when upward accelerated motion of the rocket bumps the wall of downward gravitation. I think that force bumps force and this makes load.

From your daily experience, you feel heavily when you stretch arms, and it is because of our body giving upward force against the downward gravitation on arms.

You feel heavily with legs because upward normal force from the ground bumps the downward gravitation on the legs.

When force spreading from a train through human beings in the train increases gradually, G acts on our bodies, too. This can be described as follows. The attraction of gravity acting on objects on the Earth is the resultant force of universal gravitation from every part of the Earth. So, there is an ingredient of the gravitation whose direction is opposite to the train, and the ingredient bumps the force which spreads from the train. Also, the direction of the moving train isn't fully perpendicular to the direction towards the Earth's center and its influence can be thought of.

When human beings free-fall in working gravity, the human beings can move freely for the reason that there is no bump of force. It is because there is no force which bumps the gravity.

Then, what is G defined? Define xG as load when accelerated in xg on the $1g$ Earth. Let's define more generally xyG as load when accelerated in xg against yg force.

◇G in space

On the assumption of above, let's think about G which acts on human beings when force spreads through them from their spaceship, the force increases gradually and they and their spaceship move at a same accelerated velocity.

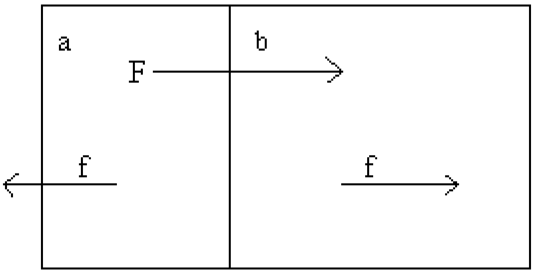
In this case, the spaceship receives reaction of the force which pushes the human beings. Therefore, the spaceship's propulsive force bumps the reaction of the human beings and G occurs. But, as for human beings, only the force spreading from the spaceship acts on them and there is no bump between force and force. Because they are in deep space. As G doesn't occur, the human beings can move freely. In this case, they are in a same condition as free fall.

But, when force spreading from the spaceship through the human beings increase rapidly, I think big load acts on the human bodies by the changes of magnitude of the force.

Well, it could be a question whether G occurs in the process that the force from the spaceship spreads through the human bodies. I try to think about this problem.

Suppose mass of a human body "m" and that you divide it in two. They are *n'th* part "a" and part of the remainder "b". a is closely united, while b is not united. Force from a spaceship "F"spreads through *n'th* part a at first and a pushes b by force "f". Then, m moves by acceleration "α".They are shown in Figure 2.

Figure 2



<About b>

As above-mentioned, in this case *G* doesn't occur because there is no bump between force and force in “the part of the remainder *b*".

<About a>

A problem lies in *G* in *n'th* part *a*.

Supposing *xyG* acts on *a, x* and *y* is asked. *a* is in accelerated motion by force of "*F-f*" against force of *f*.

As for *a*, as *f* gives acceleration *yg*, 【8】 is available. As for *b*, its dynamic equation is 【9】. As 【8】 and 【9】 is same in about *f*, 【10】 is available. Arranging 【10】, *y* is 【11】.

As the human body moves by acceleration α, 【12】 is available. Then, *x* is 【13】.

From 【11】 and 【13】, *xy* is 【14】.

From 【14】, the more *n* approaches *1*, the smaller *G* is. From 【14】, the bigger *n'th* part *a* which is closely united is, the smaller *G* is. Since it can be said that a human body is closely united, "*n* − *1*" is nearly *0*. Then, *G* is very small. *G* which acts on parts of a human body is *0* or nearly *0*.

$$f = \frac{m}{n} y g \qquad 【8】$$

$$f = m\left(1 - \frac{1}{n}\right)\alpha = \frac{m}{n}(n-1)\alpha \qquad 【9】$$

$$\frac{m}{n}(n-1)\alpha = \frac{m}{n} y g \qquad 【10】$$

$$y = \frac{n-1}{g}\alpha \qquad 【11】$$

$$\alpha = x g \qquad 【12】$$

$$x = \frac{\alpha}{g} \qquad 【13】$$

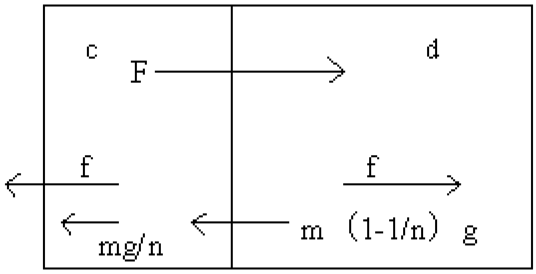
$$\begin{aligned} x y &= \frac{\alpha}{g} \times \frac{n-1}{g}\alpha \\ &= \frac{\alpha^2}{g^2}(n-1) \qquad 【14】 \end{aligned}$$

◇G in gravity

To compare with above, I try to think about *G* acting on a human body when a rocket is launched on the Earth.

In this case, supposing mass of the human body is "*m*" and you divide it in two. They are *n'th* part "*c*" and part of the remainder "*d*". *c* is closely united, while *d* is not united. Force from a spaceship *"F"* spreads through *n'th* part "*c*" at first and *c* pushes *d* by force "*f*" against gravity of *1g*. Then, *m* moves by acceleration " α ".They are shown in Figure 3.

Figure 3



<About d>

In this case, gravity rightly acts on the part of the remainder *d* and force bumps, then, *G* occurs.

Supposing *xyG* acts on *d*, *x* and *y* is asked.

As *d* moves by acceleration α against gravity of *1g*, 【16】 and 【18】 are available. Then, *y* is 【17】, and *x* is 【19】. Therefore, *xy* is 【20】.

$$1g = yg \quad 【16】$$

$$y = 1 \quad 【17】$$

$$\alpha = xg \quad 【18】$$

$$x = \frac{\alpha}{g} \quad 【19】$$

$$xy = \frac{\alpha}{g} \times 1 = \frac{\alpha}{g} \quad 【20】$$

<About c>

Supposing xyG acts on c, x and y is asked.

As c moves by acceleration α like d, 【19】 is available.

As for y, 【21】 is available. About c, its dynamic equation is 【22】. As for the whole human body, its dynamic equation is 【23】. When 【21】 is substituted for 【22】, it becomes 【24】. When F is deleted from 【24】 by using 【23】, 【25】 is available. Arranging 【25】, y is 【26】.

From 【19】 and 【26】, xy is 【27】.

$$f+\frac{m}{n}g=\frac{m}{n}yg \quad 【21】$$

$$F-f-\frac{m}{n}g=\frac{m}{n}\alpha \quad 【22】$$

$$F-mg=m\alpha \quad 【23】$$

$$F-\frac{m}{n}yg=\frac{m}{n}\alpha \quad 【24】$$

$$mg+m\alpha-\frac{m}{n}yg=\frac{m}{n}\alpha \quad 【25】$$

$$y=\frac{\alpha}{g}(n-1)+n \quad 【26】$$

$$xy=\frac{\alpha}{g}\left\{\frac{\alpha}{g}(n-1)+n\right\} \quad 【27】$$

$$\begin{aligned}xy&=\frac{\alpha}{g}\left\{\frac{\alpha}{g}(1-1)+1\right\}\\&=\frac{\alpha}{g}\end{aligned} \quad 【28】$$

In 【27】, the more closely n approaches 1, the smaller G is. But, G doesn't become smaller than α/g. If n is 1, 【27】 becomes 【28】. Then, from 【20】 and 【28】, G acts on parts of the human body is bigger than α/g.

From above, it is clear G more than a constant value works on the human body under gravity, while G in space is very small.

Though universal gravitation works on the human body and the spaceship, I disregard because it is minute.

◆Chapter 3: Galaxy traveling

Figure 4: Speed and mass of spaceship according to the theory of relativity

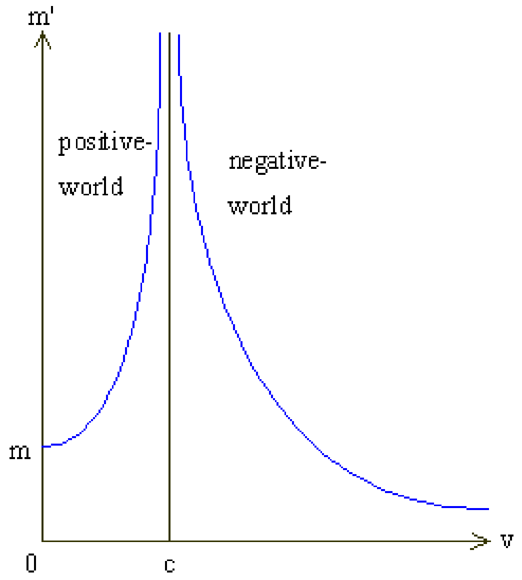


Figure 5: Speed and time of spaceship according to the theory of relativity

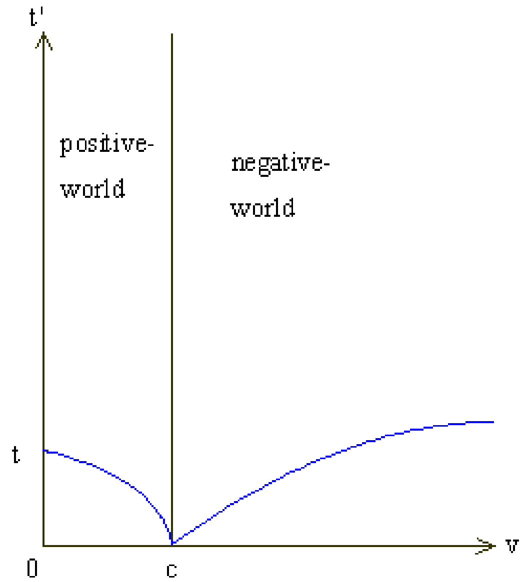


Figure 6: Elapsed time and speed of spaceship

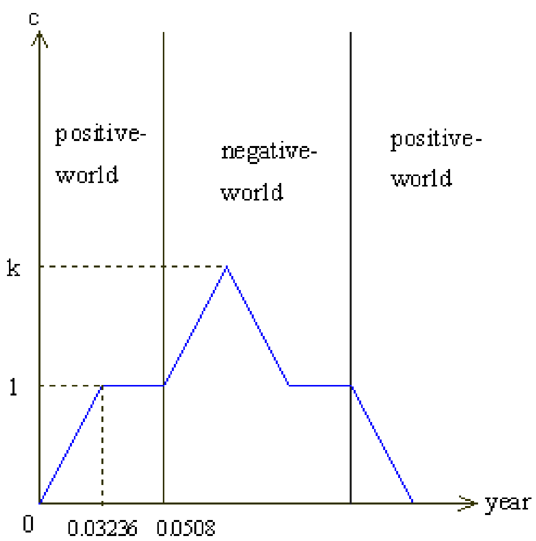
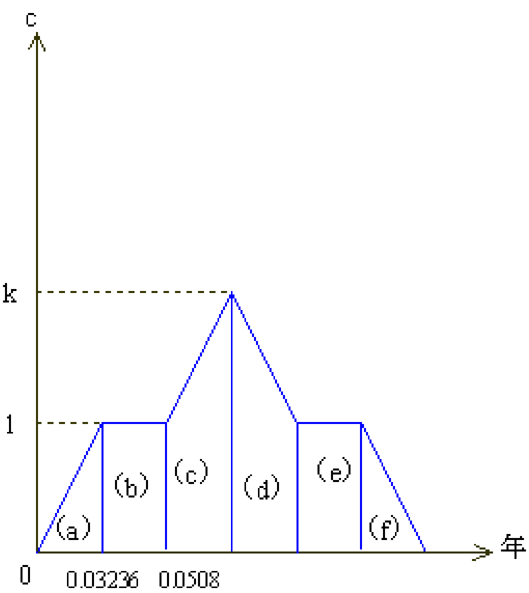


Figure 7: Divided for calculation of distance



Suppose you have new engines. They are completely new revolutionary engines which make flights of long term with constant big driving force in deep space possible. Suppose you build a star ship of which total weight "*M*" is *10,000 tons* including cargos to secure space and strength enough to travel among stars. As there is not much influence over human bodies by acceleration if keeping constant driving force after increasing driving force gradually, you can suppose the spaceship can emit *30g* driving force by the new engines.

As assumption of following calculations, the relation between lightyear and meter are shown. As one lightyear is a distance where light of 1*c* advances for a year, 【30】 is available.

$$g \fallingdotseq 9.8\,[meter/\mathrm{sec}ond^2]$$

$$c \fallingdotseq 3\times10^8\ [meter/\mathrm{sec}ond]$$

$$1year = S\,\mathrm{sec}ond = 365\times24\times60\times60\ [\mathrm{sec}ond]$$
$$1lightyear = c\,S\,meter \quad 【30】$$
$$1meter = \frac{1}{c\,S}lightyear$$

Time which this starship needs to rush into Minus-world is asked. Since "*impulse = force × time*", time is asked by dividing impulse by force. In this case, impulse is *πMc/2*, and force is *M×30g*. Then, time is calculated like 【31】, and it is *0.0508year*.

Time to reach the speed of light by acceleration *30g* is asked. Since "*speed = acceleration × time*", time is asked by dividing speed by acceleration. In this case, speed is *c*, and acceleration is *30g*. Then, time is *0.03236year*.

This time is shorter than the time to rush into Minus-world. After the spaceship reaches to speed *c* by *0.03236year*, it experiences the condition of foot dragging till it receives impulse needed to rush into Minus-world. And, as soon as the impulse reaches *πMc/2*, the spaceship rushes into Minus-world. Like this, I think, when it returns from Minus-world to Plus-world, it experiences the same condition of foot dragging in Minus-world.

$$\begin{aligned}
&\frac{\pi}{2}M\,c \div (M\times30\,g)\\
&= \pi\,c \div (2\times30\,g)\ [\mathrm{sec}ond]\\
&= \pi\,c \div (2\times30\,g) \div S\ [year]\\
&= \frac{\pi\,c}{2\times30\,g\times S}\ [year]\\
&\fallingdotseq 0.0508\,[year]
\end{aligned} \quad 【31】$$

$$\begin{aligned}
&c \div 30\,g\ [\mathrm{sec}ond]\\
&= c \div 30\,g \div S\ [year]\\
&= \frac{c}{30\,g\,S}\ [year]\\
&\fallingdotseq 0.03236\,[year]
\end{aligned} \quad 【32】$$

Suppose a starship of *10000tons* which can easily emit force of *30g* travels from the Earth to another star system. It accelerates from *0* to *kc*. As soon as its speed reaches to *kc*, it begins to deaccelerate. It accelerates with *30g* until the speed becomes *kc* from *0*. It deaccelerates with *30g* until the speed becomes *0* from *kc*.

On the assumption of above, relation between time and speed of the starship is shown in Figure 6. This Figure 6 has a symmetrical mountain

Needed time and distance which can be reached are asked on the assumption of above. Since "*distance = speed × time*", I calculate the area of the symmetrical mountain. For the convenience of the calculation, the mountain of Figure 6 is divided into six parts from (a) to (f) like Figure7. (b) and (e) are the conditions of foot dragging with speed of *1c*.

First, needed time is asked.

Time of (a)+(c) is asked. As they have same acceleration of *30g*, (a)+(c) is considered as one triangle. When the time is asked by dividing speed *kc* by acceleration *30g*, 【33】 is available. Then, when the value of "*c/30gS*" of 【32】 is substituted for 【33】, it becomes *0.03236k* like 【34】.

Time of (b) is asked. Since time of (b) is a period from time to reach to *1c* to time to rush into Minus-world, the time of (b) is 【35】 by pulling time of 【32】 from time of 【31】.

Time from speed *0* to *kc* is 【36】 by adding 【35】 to 【34】. As (a)(b)(c) and (d)(e)(f) are symmetrical, time from the Earth to the other star system is 【37】 twice 【36】.

$$
\begin{aligned}
&kc \div 30g \\
&= \frac{kc}{30g}\,[\mathrm{second}] \quad \text{【33】} \\
&= \frac{kc}{30gS}\,[year]
\end{aligned}
$$

$$
\begin{aligned}
&\frac{kc}{30gS} \\
&= k \times \frac{c}{30gS} \quad \text{【34】} \\
&= 0.03236k\,[year]
\end{aligned}
$$

$$0.0508 - 0.03236 = 0.01844\,[year] \quad \text{【35】}$$

$$0.03236k + 0.01844\,[year] \quad \text{【36】}$$

$$
\begin{aligned}
&2 \times (0.03236k + 0.01844) \\
&= 0.06472k + 0.03688\,[year] \quad \text{【37】}
\end{aligned}
$$

Then, how far by lightyears is the star system that you can reach? It is asked by the area of the mountain in Figure 6.

Area of (a)+(c) is asked. As they have same acceleration of *30g*, (a)+(c) is considered as one triangle. From 【34】, time of (a)+(c) is *0.03236k(year)*. Speed to reach is *kc*. The area of triangle (a)+(c) is 【41】.

Rectangular area of (b) is asked. From 【35】, time is *0.01844year.* Since they fly with *1c*, the rectangular area is 【42】.

Since the mountain in Figure 6 is symmetrical, the whole area of the mountain is twice the total of the area of (a)+(c) 【41】 and the area of (b) 【42】. After all, the distance to the other star system is 【43】.

$$\begin{aligned}&\frac{1}{2}\times 0.03236k\times k\\&=\frac{1}{2}\times 0.03236k^2\ [lightyear]\end{aligned} \quad 【41】$$

$$\begin{aligned}&1\times 0.01844\\&=0.01844\ [lightyear]\end{aligned} \quad 【42】$$

$$\begin{aligned}&2\times\left(\frac{1}{2}\times 0.03236k^2\right)+2\times 0.01844\\&=0.03236k^2+0.03688\,[lightyear]\end{aligned} \quad 【43】$$

I ask necessary time to go from the Earth to the Centaurus *α 4.3 light-years* away. Solving 【45】, 【46】 is available.

$$0.03236k^2+0.03688=4.3 \quad 【45】$$

$$k\fallingdotseq 11.48\,[c] \quad 【46】$$

$$\begin{aligned}&0.06472\times 11.48+0.03688\\&\fallingdotseq 0.78\ [year]\end{aligned} \quad 【47】$$

Substituting 【46】 for 【37】, you can get an answer, about *0.78 year*. You can go to and return from the Centaurus α in *2 years* in the spaceship time.

Also, in the Earth time, the converse of *Urashima Effect* occurs during super lightspeed flights in Minus-world according to 【3】 like Figure 5, you can go and return earlier than *2 years*.

Then, according to 【2】, like Figure 4, during super lightspeed flight in Minus-world, the mass decreased but I ignored its influence.

With the new engine which can give constant big force, I showed that super lightspeed flights become possible. I built this theory in the direction which gave this possibility and an anxiety from this remains. I think rushing into Minus-world in $\pi mc/2$ is sure. But is it possible to return surely from Minus-world? However, I think return from Minus-world is easier than rush into Minus-world. Because you can think returning to the world where gravitation acts on from the world where the repulsion acts on is easier than rushing into the world where repulsion acts on from the world where gravitation acts on.

I wish a door to the Era of Space Grand Navigation would be opened when we have more discussions about Minus-world in the future and it becomes theoretically sure that return from Minus-world is easy.