To string together six theorems of physics by Pythagoras theorem

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Abstract

In this paper, we point out that there are at lest six theorems in physics sharing common virtue of Pythagoras theorem, so that it is possible to string these theorems together with the Pythagoras theorem for physics teaching, the six theorems are Newton’s three laws of motion, universal gravitational force, Coulomb’s law, and the formula of relativistic dynamics. Knowing the internal relationships between them, which have never been clearly revealed by other author, will benefit the logic of physics teaching.

1 Introduction

If there is one mathematical theorem that is familiar to every university student, it is surely the theorem of Pythagoras. The theorem was embedded in physics like a gene even at the initiation of physics, because the physics begins with describing the motion of a body in a frame of reference by mathematical language—inevitably including the Pythagoras theorem. Therefore, by seizing the Pythagoras theorem, we hope draw out some deeper relationships in the physics.

Consider a particle of rest mass $m$ in our frame of reference $S(x_1, x_2, x_3, t)$, the particle moves a distance $\Delta l$ during infinitesimal time interval $\Delta t$ with speed $v$, according to Pythagoras theorem, we have

$$\Delta l^2 = v^2 \Delta t^2 = \Delta x_1^2 + \Delta x_2^2 + \Delta x_3^2 \tag{1}$$

The above equation directly forms the velocity formula given by

$$v^2 = v_1^2 + v_2^2 + v_3^2 \tag{2}$$

Multiplying the above equation by the rest mass $m$, differentiating it with respect to time, and defining a symbol $f$ as

$$f = \frac{d(mv)}{dt} \tag{3}$$

From Eq.(2), we obtain

$$\frac{d\left(\frac{1}{2}mv^2\right)}{dt} = f \cdot v \tag{4}$$

From the above two equations, we have seen what we want: when $f$ represents the force exerting on the particle, Eq.(3) is the Newton’s second law of motion, and Eq.(4) is the kinetic energy theorem.

2 An approach to Newton’s three laws of motion

We may rewrite the above section in an axiomatical way.

Axiom 1: Pythagoras theorem is valid only in inertial frame of reference.

From this Axiom we can derive out some useful consequences.

Consequence 1: The Newton’s second law of motion can be derived from the axiom 1, accompanied by deriving out the kinetic energy theorem for a particle.

Consequence 2: The Newton’s first law of motion can also be derived from the axiom 1, because of Eq.(3).

Now we consider a composite system which contains two particles Bob and Alice, whereas both Bob and Alice are also composed of many identical constituent particles, the number of the constituents in Bob is $N$, the number in Alice is $N'$. The composite system of Alice and Bob can be regraded as a single particle whose geometric center has a velocity $v_c$ given by

$$v_c = \frac{Nv + N'v'}{N + N'} \tag{5}$$

Without the lost of generality, we have supposed that the $N$ constituents of Bob have the same velocity $v$, likewise for Alice with $v'$. Since the composite system of Bob and Alice can be regraded as a single particle, it obeys the Newton’s second law of motion as

$$\frac{d[(N + N')mv_c]}{dt} = f_{ext}. \tag{6}$$
where $m$ is the mass of one constituent, $f_{\text{ext}}$ represents the external force exerting on the composite system. If the external force vanishes, then the system becomes

$$\frac{d(Nmv)}{dt} + \frac{d(N'v')}{dt} = NF + N'f' = 0 \tag{7}$$

where $f$ represents the force exerting on each constituent of Bob, likewise $f'$ on each constituent of Alice. Eq. (7) has expressed the law of action and reaction. So we get

Consequence 3: The newton’s third law of motion can also be derived from the axiom 1 for composite system.

Even if composite particle is not composed of identical constituent particles, the Consequence 3 is also valid. Because it is always possible to divide composite particle into many identical units, each unit is so small enough that the each unit has the same mass, it is not necessary for the unit to be a real elementary particle.

3 An approach to universal gravitational force

We continue to consider the composite system composed of two particles Bob and Alice, If they do not affected by external force, their motions obey the Newton’s second law of motion as

$$Bob : N\frac{d(mv)}{dt} = Nf \quad N\frac{d(\frac{1}{2}mv^2)}{dt} = Nf \cdot v \tag{8}$$

$$Alice : N'\frac{d(mv')}{dt} = N'f' \quad N'\frac{d(\frac{1}{2}mv'^2)}{dt} = N'f' \cdot v' \tag{9}$$

Let vector $r$ denote the position of Bob with respect to Alice, according to the Newton’s third law of motion, $NF + N'f' = 0$, we obtain that $f$ (or $f'$) parallel or antiparallel $r$.

Vector-multiplying Eq. (8) by $r$, because $f$ parallels $r$, we have

$$r \times [N\frac{d(mv)}{dt}] = Nm\frac{d(r \times v)}{dt} = Nr \times f = 0 \tag{10}$$

It means

$$r \times v = h = \text{const.} \tag{11}$$

where $h$ is an integral constant. Likewise for Alice. Using $f \parallel r$, we can expand $f$ in a Taylor series in $1/r$, this gives

$$f = \frac{r}{r} (b_0 + b_1 \frac{1}{r} + b_2 \frac{1}{r^2} + b_3 \frac{1}{r^3} + ...) \tag{12}$$

Substituting into Eq. (8), we obtain

$$\frac{1}{2}mv^2 = \int (f \cdot v)dt = \int |f|dr \tag{13}$$

$$= \varepsilon + b_0r + b_1 \ln r - b_2 \frac{1}{r} - b_3 \frac{1}{2r^2} - ...$$

where $\varepsilon$ is an integral constant. Now consider Eq. (14), it means that Bob moves around Alice (no matter by attractive or repulsive interaction), at the perihelion point we find

$$h^2 = |r \times v|^2 = r^2v^2|_{\text{perihelion}} \tag{14}$$

$$= \frac{2v^2}{m} (\varepsilon + b_0r + b_1 \ln r - b_2 \frac{1}{r} - b_3 \frac{1}{2r^2} - ...)|_{\text{perihelion}} \tag{15}$$

Since $b_i$ are the coefficients that are independent from distance $r$, integral constant $h$ and integral constant $\varepsilon$, they take the same values for various cases which have various man-controlled parameters $h$ and $\varepsilon$. Now we consider two extreme cases.

First case: Bob is at rest forever.

According to the Newton’s first law of motion, the interaction between them must completely vanishes. Since Bob’s speed $v$ should not depend on the distance, according to Eq. (13), a reasonable solution may be $r = \infty$, $b_0 = 0$, $b_1 = 0$ and $\varepsilon = 0$. To note that the values of $b_0$ and $b_1$ do not depend on this extreme case.

Second case: with $h \to 0$, Bob passes the perihelion point about Alice with a distance $r \to 0$.

According to Eq. (14), a reasonable solution may be that the all coefficients $b_i$ are zero but except $b_2$ and $b_3 \to 0$. Because $b_3$ does not depend on $h$, we find $b_3 = 0$.

According to the two extreme cases, we obtain a general expression given by

$$f = b_0 \frac{r}{r^3} \tag{16}$$

$$\frac{1}{2}mv^2 = \varepsilon + b_0 \frac{1}{r} \tag{17}$$

where the subscript of $b_2$ has been dropped. Likewise for Alice, we have

$$f' = a \frac{r}{r^3} \tag{18}$$

$$\frac{1}{2}mv'^2 = \varepsilon' + a \frac{1}{r} \tag{19}$$

where $a$ and $\varepsilon'$ are coefficients. To note that the above four expressions do not rely on whether the situation is extreme case.

Substituting Eq. (15) and Eq. (17) into $NF + N'f' = 0$, we get
\[ N f + N' f' = N \frac{b r}{r^3} + N' \frac{a r}{r^3} = 0 \] (19)

This equation leads to

\[ \frac{b}{N} = -\frac{a}{N} = K \] (20)

where \( K \) is a coefficient. Then Eq.(8) and Eq.(9) may be rewritten as

\[ Bob: \quad N \frac{d(mv)}{dt} = K \frac{NN'r}{r^3} \] (21)

\[ Alice: \quad N' \frac{d(mv')}{dt} = -K \frac{NN'r}{r^3} \] (22)

As the most simple case, the constituents have identical mass, so the number \( N \) of constituents in Bob and \( N' \) in Alice can directly represent the mass of Bob and the mass of Alice, respectively. If \( K \) takes a negative constant, then, the above equations show that Bob is attracted by Alice with the Newton’s universal gravitational force. Thus we get

**Consequence 4:** the Newton’s universal gravitational force can be derived from the axiom 1. But the nature of being attractive or repulsive depends on experiments.

Even if composite particles are not composed of identical constituent particles, the Consequence 4 is also valid, the reason is the same as in the preceding section.

### 3.1 An approach to Coulomb’s force

In this section we give an explanation of Coulomb’s force by using the most simple model: all particles are composed of identical constituents.

From the above section, now we can manifestly interpret the quantity \( f \) as the force exerting on a constituent of Bob. It is a natural idea to think of that constituents have two kinds of charges: positive and negative. If Bob and Alice are separated by a far distance, and \( f \) is the force acting on a positive constituent in Bob, then \( -f \) is the force acting on a negative constituent in Bob. Regardless of the internal forces in Bob, it follows from Eq.(8) that the motion of the ith constituent in Bob is governed by

\[ \frac{d(mv^{(i)})}{dt} = f^{(i)} \quad \frac{d(mv^{(i)}x)}{dt} = f^{(i)} \cdot v^{(i)} \] (23)

where \( v^{(i)} \) and \( f^{(i)} \) denote the velocity and the force acting on the ith constituent, respectively, \( m \) denote the mass of a constituent. Summing over all constituents in Bob, we get

\[ \sum_{i=1}^{N} \frac{d(mv^{(i)})}{dt} = \frac{d}{dt} \left[ m \sum_{i=1}^{N} v^{(i)} \right] = \frac{d(Nmv_c)}{dt} \] (24)

\[ \sum_{i=1}^{m} f^{(i)} = qf_c \] (25)

where \( v_c \) is the central velocity of Bob, \( q \) denotes the net charge number of Bob, \( f_c \) denotes the force acting on the constituent which locates at the geometric center of Bob (this central constituent may be virtual one because it features the average action), we obtain

\[ \frac{d(Nmv_c)}{dt} = qf_c \] (26)

Like that in the above section, the Newton’s laws of motion must be valid for the whole composite system of Bob and Alice, in other words, when they are separated from an infinite distance they are isolated, whereas they go to nearest point they should not touch each other, these requirements lead to

\[ Bob: \quad f_c = \frac{b}{r} \frac{r}{r^3} = \frac{1}{2} m v_c^2 = \varepsilon + b \frac{1}{r} \] (27)

\[ Alice: \quad f_c' = \frac{a}{r} \frac{r}{r^3} = \frac{1}{2} m v_c'^2 = \varepsilon' + a \frac{1}{r} \] (28)

where \( \varepsilon, \varepsilon', b \) and \( a \) are coefficients. According to the Newton’s third law of motion, we have \( qf + q'f' = 0 \), where \( q' \) denotes the net charge number of Alice. We get

\[ qf_c + q'f_c' = \frac{b}{r^3} m v_c^2 + q' \frac{a}{r^3} = 0 \] (29)

This equation leads to

\[ \frac{b}{q'} = -\frac{a}{q} = k \] (30)

where \( k \) is a constant. Then the motions of Bob and Alice are governed by

\[ Bob: \quad N \frac{d(mv)}{dt} = k \frac{qq'v}{r^3} \] (31)

\[ Alice: \quad N' \frac{d(mv')}{dt} = -k \frac{qq'v}{r^3} \] (32)

The Eq.(31) and Eq.(32) are known as the Coulomb’s forces.

**Consequence 5:** Coulomb’s force can be derived from the axiom 1.

Even if composite particles are not composed of identical constituent particles, the Consequence 5 is also valid. Because it is always possible to divide composite particle into many identical units, each unit is so small enough that each unit having the same mass is assigned a charge unit by keeping the net charges unchanged, it is not necessary for the unit to be a real elementary particle.
4 An approach to relativistic mechanics

Again consider a particle of rest mass \( m \) in our frame of reference \( S(x_1, x_2, x_3, t) \), the particle moves a distance \( \Delta l \) during infinitesimal time interval \( \Delta t \) with speed \( v \), according to Pythagoras theorem, we have

\[
\Delta l^2 = \Delta x_1^2 + \Delta x_2^2 + \Delta x_3^2 = v^2 \Delta t^2
\]

\[
= v^2 \Delta l^2 - c^2 \Delta t^2 + c^2 \Delta l^2
\]

\[
= c^2 \Delta l^2(1 - v^2/c^2) + c^2 \Delta l^2 \quad (33)
\]

where \( c \) is the speed of light. Defining the modified velocity

\[
u_1 = \frac{v_1}{\sqrt{1 - v^2/c^2}} \quad u_2 = \frac{v_2}{\sqrt{1 - v^2/c^2}}
\]

\[
u_3 = \frac{v_3}{\sqrt{1 - v^2/c^2}} \quad u_4 = \frac{ic}{\sqrt{1 - v^2/c^2}} \quad (34)
\]

where \( v^2 = v_1^2 + v_2^2 + v_3^2 \), from Eq.(33), we obtain

\[
u_1^2 + u_2^2 + u_3^2 + u_4^2 = -c^2 \quad \mu u_\mu = -c^2 \quad (36)
\]

where the repeated Greek indices take summation over values 1, 2, 3 and 4. The 4-vector velocity \( u = \{u_\mu\} \) is known as the relativistic velocity \( \mu \). It is convenient to define proper time interval \( d\tau = dt/\sqrt{1 - v^2/c^2} \), thus the relativistic velocity is given by

\[
\nu_\mu = dx_\mu/d\tau \quad (37)
\]

where \( x_\mu = ic t \), Eq.(36) is the magnitude formula of relativistic 4-vector velocity of particle in Minkowski’s space in its square form.

(1) The motion of the particle satisfies Eq.(36), we have

\[
mu_\mu u_\mu = -m^2 c^2 \quad (38)
\]

By defining the momentum \( P_\mu = mu_\mu \), \( P = (P_1, P_2, P_3) \), we have

\[
P_\mu P_\mu = P \cdot P = P_1^2 = -m^2 c^2 \quad (39)
\]

Differentiating Eq.(39) with respect to proper time interval \( d\tau \), we get

\[
P \cdot \left( \frac{dP}{d\tau} \right) + P_4 \frac{dP_4}{d\tau} = 0 \quad (40)
\]

By using \( P_4 = mu_4 = mic dt/d\tau = mic/\sqrt{1 - v^2/c^2} \), and introducing a 3-dimensional vector symbol \( \mathbf{F} \), the above equation becomes

\[
\mathbf{F} = \frac{d\mathbf{P}}{d\tau} \quad (41)
\]

\[
-ic \frac{d(P_4)}{d\tau} = \mathbf{F} \cdot \mathbf{v} \quad (42)
\]

Eq.(42) can be understood as: the right side represents the power of the force \( \mathbf{F} \) which exerts on the particle with the usual 3-dimensional velocity \( \mathbf{v} \); the left side represents the change rate of the energy \( E \) of the particle, i.e.

\[
E = -icP_4 = mc^2 \frac{dt}{d\tau} = \frac{mc^2}{\sqrt{1 - v^2/c^2}} \quad (43)
\]

Obviously, Eq.(43) is just the relativistic energy of the particle in relativistic mechanics, Eq.(41) and Eq.(42) are just the relativistic Newton’s second law\( \text{[2]} \). Further more, the mass \( m \) is called the rest mass of the particle while

\[
m_r(v) = \frac{m}{\sqrt{1 - v^2/c^2}} \quad (44)
\]

is called the relativistic mass of the particle. This leads to \( E = m_r c^2 \). By rewriting, Eq.(43) is given by

\[
E^2 = |\mathbf{P}|^2 c^2 + m^2 c^4 \quad (45)
\]

Eq.(45) is just the Einstein’s relationship of energy and momentum.

(2) If we define symbols

\[
cosh \alpha_\mu \equiv \frac{u_\mu}{ic} = \frac{dx_\mu}{icd\tau} \quad (46)
\]

Eq.(46) can be rewritten as

\[
\cosh^2 \alpha_1 + \cosh^2 \alpha_2 + \cosh^2 \alpha_3 + \cosh^2 \alpha_4 = 1
\]

or

\[
\cosh \alpha_\mu \cosh \alpha_\nu = 1 \quad (47)
\]

The above equation indicates that there is a definite like-Euclidean trigonometry in the Minkowski’s space, despite all that the fourth axis is imaginary, the quantity \( \alpha_\mu \) may be understood as the angle between \( dx_\nu \) and \( icd\tau \).

As the most simple case, only consider the motion taking place in the plane \( (x_1, x_4) \), the length \( icd\tau \) makes angles \( \alpha_1 \) and \( \alpha_4 \) with respect to the lengths \( dx_1 \) and \( dx_4 \) respectively, we have

\[
\cosh^2 \alpha_1 + \cosh^2 \alpha_4 = 1 \quad (48)
\]

The above equation indicates that the two angles \( \alpha_1 \) and \( \alpha_4 \) have formed a ”right-angled triangle” in the plane \( (x_1, x_4) \). By defining symbol

\[
\sinh \alpha_4 = \cosh \alpha_1 \quad (49)
\]

we get
\[
\sinh^2 \alpha_4 + \cosh^2 \alpha_4 = 1
\] (50)

From Eq. (49), we know
\[
\cosh \alpha_4 = \frac{u_4}{ic} = \frac{1}{\sqrt{1 - v^2/c^2}}
\] (51)
\[
\sinh \alpha_4 = \cosh \alpha_1 = \frac{u_3}{ic} = \frac{v}{ic\sqrt{1 - v^2/c^2}}
\] (52)

where \( v = v_1 = dx_1/dt \) for the simple case.

(3) In the Minkowski’s space, if the coordinate system \( S(x_1, x_2, x_3, x_4) \) ”rotates” through an angle \( \alpha \) in the plane \( (x_1, x_4) \), and becomes another new coordinate system \( S’(x_1’, x_2’, x_3’, x_4’) \). According to Eq. (51), the transformation of the two systems \( S \) and \( S’ \) will be given by

\[
x_1’ = x_1 \cosh \alpha - x_4 \sinh \alpha
\] (53)
\[
x_2’ = x_2
\]
\[
x_3’ = x_3
\]
\[
x_4’ = x_1 \sinh \alpha + x_4 \cosh \alpha
\] (54)

By comparison, we know that this \( \alpha \) is just that \( \alpha_4 \) of Eq. (51). Substituting Eq. (51) and Eq. (52) into the above equations, and using \( x_4 =ict \) and \( x_4’ = ict’ \), we get

\[
x_1’ = \frac{x_1}{\sqrt{1 - v^2/c^2}} - \frac{vt}{\sqrt{1 - v^2/c^2}}
\] (55)
\[
x_2’ = x_2
\]
\[
x_3’ = x_3
\]
\[
t’ = -\frac{x_1v/c^2}{\sqrt{1 - v^2/c^2}} + \frac{t}{\sqrt{1 - v^2/c^2}}
\] (56)

(4) If Bob is at rest at the origin of the system \( S’ \), i.e. \( x_1’ = 0 \), from Eq. (55), we know that Bob will be moving at speed \( v = dx_1/dt \) in the system \( S \). In other words, the system \( S’ \) is fixed at Bob, while Bob is moving at the speed \( v \) along the axis \( x_1 \) of the system \( S \). Coupling with this explanation, Eq. (55) and Eq. (56) are just the Lorentz transformation.

(5) The constancy of the speed of light, length contraction and time dilation can evidently be derived from the Lorentz transformation equations.

Therefore, we get

\textit{Consequence 6: The formula of relativistic dynamics can be derived from the axiom 1.}

5 Two kinds of 4-vector forces

(1) In Minkowski’s space, according to Eq. (11) and Eq. (12), we can define a 4-vector force as

\[
f \equiv (F, f_4)
\] (57)
\[
f_4 = -\frac{F \cdot u}{u_4}
\] (58)

then Eq. (11) and Eq. (12) may be rewritten as

\[
f = \frac{d(mu)}{d\tau} \quad \text{or} \quad f_\mu = \frac{d(mu_\mu)}{d\tau}
\] (59)

Obviously, the 4-vector force \( f \) and 4-vector velocity \( u \) satisfies orthogonal relation \( 0 \).

\[
u \cdot f = u_\mu f_\mu = u_\mu \frac{d(mu_\mu)}{d\tau} = m \frac{d(-c^2)}{d\tau} = 0
\] (60)

This result is easy to be understood when we note that the magnitude of the 4-vector velocity keeps constant, i.e. \( |u| = \sqrt{u_\mu u_\mu} = ic \), any 4-vector force can never change the magnitude of the 4-vector velocity but can change its direction in the Minkowski’s space.

The orthogonal relation of 4-vector force and 4-vector velocity is a very important feature for basic interactions \( 1 \).

(2) In analogy with the relativistic mechanics, Newton’s mechanics may also have its own 4-vector force.

According to Eq. (3) and Eq. (4), we define 4-vector quantities in Newton’s mechanics as

\[
\bar{v} \equiv (v, iv) = (v_1, v_2, v_3, iv)
\] (61)
\[
\bar{f} \equiv (f, f_4) = (f_1, f_2, f_3, f_4 - \frac{f_1}{iv})
\] (62)
\[
\bar{f} = \frac{d(m\bar{v})}{dt}; \quad \bar{f}_\mu = \frac{d(m\bar{v}_\mu)}{dt}
\] (63)
\[
\bar{v} \cdot \bar{v} = \bar{v}_\mu \bar{v}_\mu = 0; \quad \bar{v} \cdot \bar{f} = \bar{v}_\mu \bar{f}_\mu = 0
\] (64)

where the magnitude of the 4-vector velocity \( \bar{v} \) keeps the constant zero, so that the 4-vector force \( \bar{f} \) and the 4-vector velocity \( \bar{u} \) satisfies the orthogonal relation of Eq. (54), while Eq. (55) represents the Newton’s second law in the 4-vector form.

(3) Both Newton’s mechanics and relativistic mechanics can be derived from the same Pythagoras theorem in a rigorous manner, but modern physics have clearly show that it prefers to the relativistic mechanics, it was said that the newton’ mechanics is an excellent approximation when the motion is slow with respect to the speed of light.

If we use the speed of sound to replace the speed of light in Eq. (13), we would obtain a dynamics resemble to the relativistic mechanics, in which the speed of sound takes place the role of the speed of light, how do physics accept it?
Generally speaking, we have absolute confidence on Pythagoras theorem, we have no doubts on the preceding results which have realize the geometrization of physics, we must equally treat with the Newton’s mechanics and the relativistic mechanics, rather than that one is another’s approximation. The author is not intent to shake the established modern physical contents but to pursue the faith coming from the Pythagoras theorem, the Pythagoras theorem is also an well established law which is at least 2500 years old.

Why the nature seems to prefer to the relativistic mechanics ? We here gives a trial explanation. In one hand, to note that all measurements about distance and time must use facilities whose principles are directly or indirectly based on the light, therefore, all phenomena in our optical eyes or instruments have had to involve the speed of light, so that the action we perceive is the force $F$ of Eq.(41) rather than the force $f$ of Eq.(3), hence the nature we perceive is the would obeying the relativistic mechanics. In another hand, if our measurements are accomplished by virtue of infinite communicating speed (if it exists ), the nature we perceive will be the world obeying the Newton’s mechanics. This explanation is completely compatible with the standard contents of modern physics, because we knew in textbooks\[5\][6] that relativistic mechanics reduces to Newton’s mechanics when $c$ becomes infinite, proofing that our effort is not intent to offend the established physics but to provide a new insight into the subject.

6 Discussion

(1) The six theorem derived from Pythagoras theorem in the preceding sections form the fundamentals of mechanics, from them other useful theorems, such as the Lagrange’s Equation and Hamilton’s principle, etc., can also be derived out. With this results, we recognize that the Pythagoras theorem is the origin of the whole mechanics. It becomes possible to establish an axiomatical system for the subject, both for teaching and research, especially, the experiments addressing to to test the mechanics may be canceled from our classroom because an axiomatical system couldn’t tolerate the existence of many initiations in the subject.

(2) What is the inertial frame of reference? Our answer is that the frame in which Pythagoras theorem is valid is just the inertial frame of reference. This answer has a little different from that in traditional textbooks. In an accelerated frame of reference, Pythagoras theorem needs a modification, this situation open a way leading to the subject of general theory of relativity.

(3) Eq.(12) expresses the interaction expanded in a Taylor series in $1/r$. letting it contain a Taylor series in $r$ is not necessary, because the $r$ series would be canceled when we need the interaction vanishes for $r \to \infty$.

(4) Pythagoras theorem has a long history, after Greek philosopher Pythagoras ( 500 B.C. ). Other ancient civilizations also have the same theorem, such as India ( 500 B.C.—200 B.C.)\[7\], China ( 1100 B.C.—200 B.C. )\[8\]. In China, Pythagoras theorem is called the GouGu theorem, even today. Both western and eastern share the common wisdom of their ancient civilizations.

7 Conclusion

In this paper, we regard Pythagoras theorem as an axiom, from this axiom we derived out six important theorems of physics, they are Newton’s three laws of motion, universal gravitational force, Coulomb’s force, and the formula of relativistic dynamics. The results indicate that at least the mechanics is possible to be geometrized, so that it is possible to string together these theorems with Pythagoras theorem. Knowing the internal relationships between them, which have never been clearly revealed by other author, will benefit our physics teaching.

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