A BREAKTHROUGH IN GRAVITATION & SPECIAL RELATIVITY

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ABSTRACT:

Briefly these equations calculate acceleration due to gravity, escape velocity, distance between two masses etc. without using the gravitational constant; instead they make calculations using velocity of electromagnetic waves in vacuum which is a universal constant.

These equations are based on Lorentz transformation which is the base of special relativity. From this research it has become clear that gravitation and other fields are potential energy of universe and mass is its kinetic energy and acceleration due to fields is due to the law of conservation of energy. These equations can provide the missing connection between gravitation and other fields and can open many doors in Unified Field research.

INTRODUCTION

I believe the most wonderful and beautiful areas in Physics are Einstein's theory of relativity and Plank's quantum theory. These theories have literally laid down the foundations of modern Physics and have revolutionized ways in which Physicists used to think.

The most astonishing part of my research is that acceleration due to gravity; radius of any planet, escape velocity can be derived from relativistic formulas. I have derived an equation:

$$m(c^2 \pm ar) = h\nu$$

This equation I feel is going to solve many and may be all problems in Physics, from gravitation to unified field and from wave-particle duality to quantum mechanics and much more can be derived from this equation.

Here I am presenting a new research which for the first time makes calculations for gravitational phenomena without using gravitational constant.

FORMULAS & THEIR APPLICATIONS

Escape velocity is the velocity required by any body to blast off into space from the surface of a planet such as Earth. The escape velocity of Earth is 40,000 km/hr anything traveling at lesser velocity will eventually fall back on Earth. Here is a formula that calculates escape velocity from the surface of any planet, moon, star etc.

ESCAPE VELOCITY

$$v = \sqrt{\left|\left\{\frac{1}{\left(\frac{\pm ar}{c^2} + 1\right)}\right\}^2 - 1\right| c^2}$$

Let's first solve it for Earth:

Let a = acceleration due to gravity at Earth's surface.
r = radius of Earth.
v = escape velocity of Earth from its surface.
c = velocity of light.

$$v = \sqrt{\left|\left\{\frac{1}{\left(\frac{\pm 9.8x6.37x10^{6}}{9x10^{16}}+1\right)}\right\}^{2} - 1\right| 9x10^{16}}$$

Solving the equation we get

v = 11173.719 m/s or
v = (11173.719 x 60 x 60) / 1000 = 40225.389 km/hr

This is in fact the escape velocity of Earth. The most important point to be noted is that this formula has not used the gravitational constant, instead this formula is entirely based on one constant i.e. the universal constant c = $3x10^8$, acceleration due to gravity and radius.

I have tested this formula for moon, sun and planets other than Earth and it gives correct results. For moon acceleration due to gravity on surface is, a = 1.62 m/s^2, the radius of moon, r = $1.738x10^6$m

$$v = \sqrt{\left|\left\{\frac{1}{\left(\frac{\pm 1.62x1.738x10^{6}}{9x10^{16}}+1\right)}\right\}^{2} - 1\right| 9x10^{16}}$$

Solving the equation we get:

v = 2372.9981 m/s or
v = (2372.9981x60x60)/1000 = 8542.793 km/hr

The slight variations in calculated and experimental values is due to the fact that calculations are made using few digits after decimal, and 9.8 & $3x10^8$ are rounded off values of acceleration due to gravity and velocity of light. Also due to variation in the radius of Earth at different places we get slightly different experimental values, but accurate values will be obtained using accurate figures for the exact place, and including other figures like centrifugal force and friction.

ACCELERATION & DISTANCE FORMULAS

The following formula can be used to calculate the acceleration due to gravity for a body falling freely on Earth and the distance from Earth's center to the center of body in free fall.

$$\pm ar = c^{2}\left(\frac{1}{\sqrt{1-(v/c)^{2}}}-1\right)$$

Let's solve this first for acceleration due to gravity on Earth's surface.

$$a = \frac{c^2}{r}\left(\frac{1}{\sqrt{1-(v/c)^2}} - 1\right)$$

Let a = acceleration due to gravity on surface.
r = radius of Earth.
v = escape velocity.
c = velocity of light.

$$a = \frac{9x10^{16}}{6.37x10^{6}}\left(\frac{1}{\sqrt{1-(11173.719/3x10^{8})^2}} - 1\right)$$

Solving this equation we get,

a = 9.79 m/s^2

This is the acceleration due to gravity on Earth's surface; it is slightly less than experimental value due to centrifugal force and difference in radius of Earth at equator and poles. Taking that in account it will give precise answer.

This formula can be used to determine acceleration due to gravity at any distance above the surface of Earth calculated from its center by knowing the escape velocity at that distance.

I have tested these formulas for other planets, sun, moon and they give accurate results for all cases.

DERIVATION OF $m(c^2 \pm ar) = h\nu$

Einstein has proved that $mc^2 = h\nu$, also he has showed that kinetic energy (K.E) of a body in view of mass variation formula at high velocities is,

$K.E = (m - m_\circ)c^2 = \Delta mc^2$ Or

$$K.E = \left(\frac{m_\circ}{\sqrt{1-(v/c)^2}} - m_\circ\right)c^2$$

I said to myself that in classical Physics the energy equation is,

E = K.E + P.E

Also the same equation is used in quantum mechanics, why not we can compare kinetic energy and potential energy due to gravity on the same grounds? i.e.

$\Delta mc^2 + mar = E$ Or

$m(c^2 + ar) = E$ Or

$m(c^2 + ar) = h\nu$ (EQ 1)

To test equation 1, let's solve it for 'c' since it is a universal constant and its value is well established to be $3x10^8$m/s.

$$mc^2 + mar = h\nu$$
$$m(c^2 + ar) = h\nu$$
$$c^2 + ar = \frac{h\nu}{m}$$
$$c^2 = \frac{h\nu}{m} - ar$$
$$c = \sqrt{\frac{h\nu}{m} - ar} \qquad \text{(EQ 2)}$$

To test this equation lets determine, 'ν' or frequency of Earth using,

$$mc^2 = h\nu$$
$$\nu = \frac{mc^2}{h}$$
$$\nu = \frac{6x10^{24}x9x10^{16}}{6.6262x10^{-34}}$$
$$\nu = 8.149x10^{74} \text{ Hz}$$

This will be the frequency of Earth if it is considered as a wave, putting these values in EQ 2 we get,

m = mass of Earth = $6x10^{24}$ Kg.
ν = frequency of Earth = $8.149x10^{74}$ Hz.
h = plank's constant = $6.6262x10^{-34}$
a = acceleration due to gravity = 9.8 m/s^2
r = radius of Earth = $6.37x10^6$ m

$$c = \sqrt{\frac{6.6262x10^{-34}x8.149x10^{74}}{6x10^{24}} - 9.8x6.37x10^6}$$

Solving this equation we get,

c = $3x10^8$ m/s.

Since 'ar' is a very small value as compared to $\frac{h\nu}{m}$ we can write this equation with –ar also i.e.

$$m(c^2 - ar) = h\nu \qquad \text{(EQ 3)}$$

Solving for 'c' we get,

$$c = \sqrt{\frac{h\nu}{m} + ar}$$

Putting values for Earth as above we get,

c = $3x10^8$ m/s.

Combining EQ 1 & EQ 3 we get,

$$m(c^2 \pm ar) = h\nu \qquad \text{(EQ 4)}$$

DERIVATION OF ACCELERATION, RADIUS & VELOCITY FORMULAS

This is the main equation from it equations for acceleration due to gravity, distance between masses & escape velocity can be derived.

$$m\left(c^2 \pm ar\right) = h\nu$$

Since $h\nu = mc^2$,

$$m(c^2 \pm ar) = mc^2$$
$$mc^2 \pm mar = mc^2$$
$$\pm mar = mc^2 - mc^2$$
$$\pm m_{\circ}ar = \frac{m_{\circ}c^2}{\sqrt{1-(v/c)^2}} - m_{\circ}c^2$$ (This equation shows the equivalence of KE. & P.E.)

$$\pm ar = c^2\left(\frac{1}{\sqrt{1-(v/c)^2}} - 1\right) \qquad \text{(EQ 5)}$$

We have already tested equation 5 for Earth and moon, it can be written in two more forms,

$$a = \frac{c^2}{r}\left(\frac{1}{\sqrt{1-(v/c)^2}} - 1\right) \qquad \text{(EQ 6)} \quad \&$$

$$r = \frac{c^2}{a}\left(\frac{1}{\sqrt{1-(v/c)^2}} - 1\right) \qquad \text{(EQ 7)}$$

So these are the equations for calculating acceleration due to gravity ‘a’ and distance between centers of two masses ‘r’.

The interesting thing is that these equations are derived from relativistic formulas only constant used is ‘c’ i.e. velocity of light or electromagnetic waves in vacuum.

It is independent of ‘G’ i.e. gravitational constant instead makes calculations based on ‘c’ which is a universal constant.

DERIVATION OF ESCAPE VELOCITY FORMULA

From EQ.5 we have,

$$\pm ar = c^2\left(\frac{1}{\sqrt{1-(v/c)^2}} - 1\right)$$

Let's solve this equation for 'v' that appears as a variable for velocity inside Lorentz transformation.

$$\pm ar = \frac{c^2}{\sqrt{1-(v/c)^2}} - c^2$$

$$\pm ar + c^2 = \frac{c^2}{\sqrt{1-(v/c)^2}}$$

$$\frac{\pm ar}{c^2} + \frac{c^2}{c^2} = \frac{1}{\sqrt{1-(v/c)^2}}$$

$$\frac{\pm ar}{c^2} + 1 = \frac{1}{\sqrt{1-(v/c)^2}}$$

$$\sqrt{1-(v/c)^2}\left(\frac{\pm ar}{c^2} + 1\right) = 1$$

$$\sqrt{1-(v/c)^2} = \frac{1}{\left(\frac{\pm ar}{c^2} + 1\right)}$$

Squaring both sides we get,

$$-(v/c)^2 = \left\{\frac{1}{\frac{\pm ar}{c^2} + 1}\right\}^2 - 1$$

Taking absolute value on both sides we get,

$$v^2 = \left|\left\{\frac{1}{\frac{\pm ar}{c^2} + 1}\right\}^2 - 1\right| c^2$$

Taking square root on both sides,

$$v = \sqrt{\left|\left\{\frac{1}{\frac{\pm ar}{c^2} + 1}\right\}^2 - 1\right| c^2} \qquad \text{(EQ 8)}$$

This is the formula that gives escape velocity based on acceleration due to gravity and radius.

Following are the equations which we have derived,

$$m(c^2 \pm ar) = h\nu$$

$$a = \frac{c^2}{r}\left(\frac{1}{\sqrt{1-(v/c)^2}} - 1\right)$$

$$r = \frac{c^2}{a}\left(\frac{1}{\sqrt{1-(v/c)^2}} - 1\right)$$

$$v = \sqrt{\left[\left\{\frac{1}{\frac{\pm ar}{c^2}+1}\right\}^2 - 1\right]c^2}$$

Another proof of $\pm ar$ is that in 'v' formula it gives same answer in both forms i.e. –ar or +ar. Since a, r, v formulas are independent of mass and $\pm ar$ is correct in both negative and positive forms. This gives us reason to believe that these formulas are not only good for gravitational field but for electromagnetic and nuclear fields as well. These formulas can be the long sought link between all fields leading to the UNIFIED FIELD THEORY. Their application on electromagnetic and nuclear fields can be tested by experiment.

Following are values calculated by these formulas for members of our solar system.

ASTRONOMICAL OBJECT	SURFACE GRAVITY (m/s^2)	RADIUS (meters)	ESCAPE VELOCITY (m/s)
SUN	274	6.96×10^8	617581
MERCURY	3.78	2.44×10^6	4294.927
VENUS	8.6	6.05×10^6	10200.98
EARTH	9.78	6.37×10^6	11162.31
MOON	1.62	1.738×10^6	2372.998
MARS	3.72	3.395×10^6	5025.813
JUPITER	22.9	71.5×10^6	57224.99
SATURN	9.05	60×10^6	32954.51
URANUS	7.77	25.5×10^6	19906.53
NEPTUNE	11.0	24.75×10^6	23334.52
PLUTO	0.58	1.1505×10^6	1155.24

SUMMARY

1. These formulas can be used to derive a complete and precise explanation of all gravitational phenomena.
2. Application of these formulas can be tested for all fields and if they hold true for electromagnetic & nuclear fields as well, these will evolve in long sought Unified Field Theory.
3. These formulas can be applied and tested on Quantum Theory and its mechanics.
4. Dual nature of matter can be investigated with help of these equations.
5. In fact entire science of Physics can be derived from $m(c^2 \pm ar) = h\nu$. It can solve all matter, field, wave etc. related problems and pave way for UNIFIED PHYSICS in which same set of equations can be used to solve all physical phenomena.