# ON THE FORCES AND SPEEDS OF SIMPLE HARMONIOUS MOVEMENT AND THE PRINCIPLE OF CONSERVATION

## INTRODUCTION

The [1] infinitesimal calculus, with the help of which centripetal acceleration was proved, was questioned. Here, with stadard mathematics, we'll prove the realy centripetal acceleration, that combines with orbital acceleration, and these two give the acceleration called centripetal, but realy is para-centripetal.

Before all this, we will establish the orbital velocity and the centripetal velocity, and of these two the para-orbital is combined, which is what we accept as the mobile speed constant circularly about the center.

By analyzing the simple harmonic motion of the pendulum, we will get equal gravitational and inertial mass, in a privileged planet frame system, but in parallel with the principle of conservation of mechanical energy, the principle of maintaining the square of acceleration, or the principle of maintaining the square of force, applies.

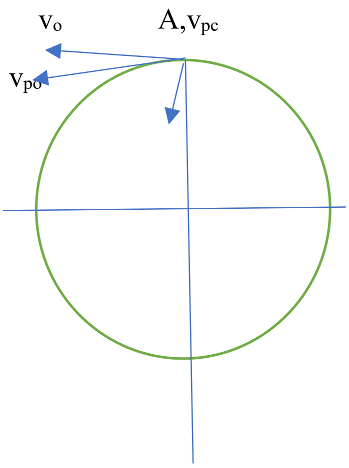
## METHODOLOGY

Inductive reasonings and abductive ones are used. Induction is the main element, structure of this work. To use these, definitions are needed, such as the velocity and acceleration, or the position vector that precedes them, and on them with reasoning we are stressed in our theory.

The mathematics used here is unwavering and therefore the conclusions and findings safe.

[1] [1]ALEKOS CHARALAMPOPOULOS, OVERTURNING OF INFINITESIMAL CALCULUS AND RESTORATION OF THE MATHEMATICS IN CONNECTION WITH THE COSMIC THEORY "THE IDION' International Journal of Mathematics and Physical Sciences Research, Oct2020-Mar2021

SIMPLE HARMONIC MOVEMENT




We consider a mobile with a constant speed $v_{po}$ that brings circles with radius $R_0$. The speed will be,

$$v_{po} = \frac{\Delta x}{\Delta t} = \frac{2\pi R_0}{T} = \omega R_0 \qquad \text{and} \quad T = \frac{2\pi R_0}{v_{po}} \qquad (1)$$

The mobile on the horizontal axis will have a radius $R=R_0\cos(\omega t+\varphi)$, with the initial condition $\varphi=0$. It will have a speed, which will increase from zero to $0^0$, to an angle of $90^0$ where it becomes 1, in a period of T /4.

Then,

$$v= \Delta R/\Delta t= (R_0/T/4)\{\cos(90^0)-\cos(0^0)\}=-4R/T \text{ και } v=-4R_0/ T=v_0=-(2/\pi)\omega R_0.$$

Because speed is,

$$\Delta R/\Delta t=v=v_0\Delta\cos(\omega t) \text{ and } \cos^2(\omega t)=1-\sin^2(\omega t), \text{ then,}$$

$$v^2=v_0^2\Delta\{1-\sin^2(\omega t)\}=v_0^2\Delta(-\sin^2(\omega t)))=-v_0^2 \{\sin^2(90^0)-\sin^2(0^{0\,0})\}.$$

And $v=v_0\sin(\omega t)$.

But this speed harmoniously ranges from $0^0$, where it is zero , to $90^0$, where it is 1 the sine. Then it will be the average speed, because the real one ranges from 0, to 1,

$$\bar{v} = 1/2 (in_0+0),$$

that is, on the horizontal axis at the center, the speed is,

$$\bar{v} = 1/2\ in_0=2R/T$$

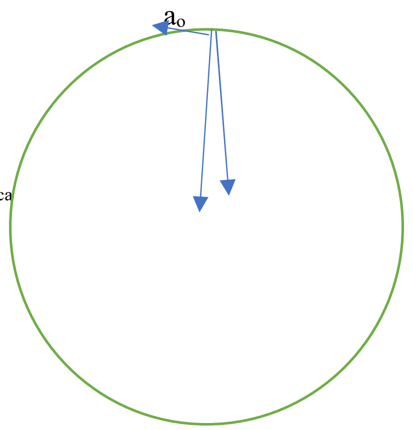
This is the average speed, which is perpendicular to the radius R, when R is at $90^{0.}$ . It is less than $v_{po}=2\pi R_0/T=\omega R_0$, because it falls short of it and is as we said, $v_0=-4R/T=-(2/\pi)\omega R_0$ .

And the resulting para-centripetal speed also arises,

$$v_{pc}^2= v_{po}^2- v_o^2 = (4\pi^2R_0^2/T^2)-16R_0^2/T^2 \text{ and}$$

$v_{pc}=4.\ 85R_0/T$.

THE ACCELERATIONS




orbital acceleration a $_c$, centripetal $a_c$ and para-centripetal $a_{pc}$

But the para-centripetal acceleration, will be,

$$a_p = \Delta x/\Delta t^2 = 2\pi R_0/T^2 = v_{po}/T \text{ και βάσει της (1) είναι,}$$

$$a_p = v_{po}^2/2\pi R_0$$

We see that with the unshakable mathematics we have applied, this acceleration $a_p$ corresponds to the centripetal acceleration, the one invoked by established physics and which does not have the $2\pi$ in the denominator and is in fact a para-centripetal.

We recall that we found a velocity maximum, $v=\Delta R/\Delta t=v_0=(4R_0/T)$, when $v= -v_0\cos(\omega t)$, in the center of the circular motion. centripetal acceleration, in the center, will be,

$$a_c=\Delta R/\Delta t^2=(v_0/T) = v_0\, v_{po}/2\pi R_0$$

And there is an orbital acceleration $a_o^2= a_p^2 - a_c^2$, then

$$a_o=v_{po}(v\ po\text{-}v\ _o)^{1/2}/2\pi R_0=(2\pi+4)R_0/T^2=\{(2\pi+4)/2\pi\}\omega^2R_0$$

That is, in the body thatorbits circularly around the center, at a constant speed, there is an orbital acceleration, which is neutralized by a force of friction.

It is, $v=-v_0 son(\omega t)$, then,

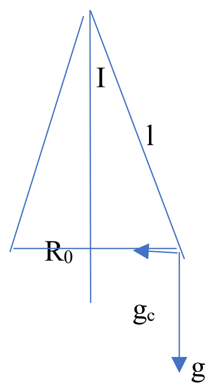
$$\Delta v/\Delta t=a_c=\Delta\{(-v_0/T)\sin(\omega t)\}.$$

And because, $T=2\pi R_0/v_{po}$, then,

$$a_c^2=-(v_o v_{po}/2\pi R_0)^2\Delta\{1-\cos^2(\omega t)\} =-(v_o v_{po}/2\pi R_0)^2\Delta(-\cos^2(\omega t\ ), \text{ and,}$$

$$a_c\ =-(v_o v_{po}/2\pi R_0)\cos(\omega t)=-(4R_0/T^2)\cos(\omega t)=-(\omega^2R_0/\pi^2)\cos\ (\omega t)$$

THE SIMPLE HARMONIC OSCILLATION OF THE PENDULUM AND THE MASS




We consider a pendulum, where mass m hovers in small oscillations of angle θ. Then the gravity acceleration will be g and also then the acceleration to the equilibrium position, will be $g_c$=-gtanθ.

Experimentally and theoretically in the pendulum, the angular frequency is $\omega^2=g/l$. But the angular frequency ω, belongs to a circular motion of constant velocity, radius $R_0$. Then the acceleration of this movement, will be,

$$a_c=-(\omega^2 R_0/\pi^2)\cos(\omega t)=-(\omega^2 R_0/\pi^2)$$

when the acceleration is in $R_0$ radius.

MAINTENANCE OF ACCELERATOR SQUARES

Then $g_c/a_c = g\tan\theta/(\omega^2 R_0/\pi^2)$.

The $g_c$ andι $a_c$ will be equal, only then $\tan\theta= (\omega^2 R_0/\pi^2)/g$. But we say, $g_c=-g\tan\theta$ then and $g=-g_c/\tan\theta$ and then $g_c=a_c$.

It is the only case, when the pendulum is fully open, the accelerations are equal, therefore the gravitational and inertial mass equal! in all other oscillation positions of the pendulum, $a_c$ is less.

Again, $\tan\theta= (\omega^2 R_0/\pi^2)/g= (\omega^2 R_0/\pi^2)/\omega^2 l$, so $\tan\theta=R_0/\pi^2 l$. This angle θ is unique when giving $R_0$ and l=pendulum length, so that $a_c$ and $g_c$ are equal.

From $g_c$=-gtani we find,

$$g_c\cos\theta=-g\sin\theta==-(\omega^2 R_0/\pi^2)\cos(\omega t)= g_c\sin\theta \ \ \text{και}$$

$$\{(\omega^2 R_0/\pi^2)^2\cos^2(\omega t)+ g_c^2\sin^2(\omega t)= a_c^2=g_c^2.$$

This is the preservation of the squares of the acceleration of a harmonic motion, the square of $a_c$ decreases and increases the square of $g_c$ respectively, so that the sum is always the square of one of them that is equal to each other.

And $a_c$ corresponds to the kinetic energy (kinetic acceleration), and $g_c$ corresponds to the dynamic energy (dynamic acceleration).

This means that the square of the force in a simple harmonic motion is maintained and alternated between square dynamic and kinetic acceleration.

SUMMARY

Unspoiled mathematics proves that there is a para-orbital velocity $v_{po}=2\pi R_0/T$ (1), (by definition), a para-centripetal and an orbital.

The centripetal acceleration of established physics in all cases, turned out to be $F=mv_{po}^2/R_0$, with an infinitesimal calculus, which has already been strongly questioned.

But this force, which is actually para-centripetal, is $F_{po}=mv_{po}/T$ and based on (1) $F_{po}=mv_{po}^2/2\pi R_0$. Mathematics is unshakable and sends bohr's theory of the hydrogen atom and Shcroedinger's theory and Newton's theory of the planetary system into error.

Instead of para-centripetal acceleration in the atom or planetary system, the centripetal system should now be used, which is $a_c=\{(2\pi+4)/2\pi\}\omega^2R_0$,

And there is also a small acceleration, which is neutralized by friction force and ether deceleration.

The square of force and acceleration that develops in a periodic motion, is maintained as is the mechanical energy, which alternates between dynamics and kinetics.

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