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Koide Formula Corrections

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Abstract. I will show you several versions of the Koide formula, corrected until the accurate result 2/3 is obtained.

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Introduction

The famous Koide formula [1] connects the masses of charged leptons with a simple formula:

$$\left(m_e + m_\mu + m_\tau\right) \Big/ \left(\sqrt{m_e} + \sqrt{m_\mu} + \sqrt{m_\tau}\right)^2 \approx 2/3 \qquad \textbf{(1)}$$

I am using the following CODATA values, [2]:

Inverse of the fine-structure constant	ά=137.035 999 074 (44),
Mass ratio of protons and electrons	μ= 1836.152 672 45 (75)
Proton mass	m_p=1.672 621 777 (74) e-27 kg
Electron mass	m_e=9.109 382 91 (40) e-31 kg
Muon mass	m_μ=1.883 531 475(96) e-28 kg
Mass of tau particle	m_τ= 3.167 47 (29) e-27 kg
Reduced Planck constant	$\hbar$ =1.054 571 726 (47) e-34 J s
Speed of light in vacuum	c=299 792 458 (exact) m s^{-1}
Newton's gravitational constant	G=6.673 84 (80) e-11 m^3 kg^{-1} s^{-2}

Also, from [4]:

Mass of the Universe	M_u=1.739449*10^{53} kg
Cycle of the Universe	T_u=4.30849 *10^{17} sec .

We have:

$$\left(m_e + m_\mu + m_\tau\right) \Big/ \left(\sqrt{m_e} + \sqrt{m_\mu} + \sqrt{m_\tau}\right)^2 = 0.666658 \qquad \textbf{(2)}$$

In my previous article [3], I showed the formula (3)

$$x = \left(m_e + m_\mu + m_\tau\right) / \left(\sqrt{m_e/\zeta} + \sqrt{m_\mu} + \sqrt{m_\tau}\right)^2 - 1/\left[\pi * \left(e^{2\pi}/2 + \log(2\pi, 2) - zp/3\right)\right] = 2/3 \qquad \textbf{(3)}$$

Where:

$$\textbf{zp=2-1/(μ/α'+2)}=1.9350609435 \quad ; \quad \zeta = 2\pi\alpha * 2^{2zp/3} = 1.146691715 \qquad \textbf{(4)}$$

Below I will show that the above corrections of (3) in relation to (2) have the same source and that formula (3) can be expressed in a more simple way, as in (5), (6).

Alternative formulas

$$x = \left(m_e + m_\mu + m_\tau\right) / \left(\sqrt{m_P / (\alpha' * 2^k)} + \sqrt{m_\mu} + \sqrt{m_\tau}\right)^2 - 1 / \left[\pi * \left(k + p\right)\right] = 2/3 \qquad \textbf{(5)}$$

$$x = \left(m_e + m_\mu + m_\tau\right) / \left(\sqrt{m_f / \alpha'} + \sqrt{m_\mu} + \sqrt{m_\tau}\right)^2 - 1 / \pi f = 2/3 \qquad \textbf{(6)}$$

Where from [4] we get:

$\mathbf{p=e^{2\pi}/2-zp}$=535.4916555/2-1.9350609435=265.810766819 **(7a)**

or

$\mathbf{p=\log_2(M_u/m_p)}$=$\log_2$(1.739449*$10^{53}$/1.672 621777*$10^{-27}$)= 265.810766819 **(7b)**

$\mathbf{k=e^{2\pi}/3-2p/3+\log_2(2\pi)}$=535.4916555/3-2*265.810766819/3+2.6514961395=3.9415367585 **(8)**

while in (6) $\mathbf{m_f}$ is fundamental mass, from [5, formula 1], or similarly in [6, formula 16.4.2], which satisfies a simple formula:

$$m_f = (\hbar^2 / T_u G c)^{1/3} = 1.088621616\text{E-}28\,\text{kg} \qquad \textbf{(9)}$$

Moreover:

$\mathbf{f=\log_2(M_u/m_f)}$=$\log_2$(1.739449*$10^{53}$/ 1.088621616*$10^{-28}$)= 269.7523035773 **(10)**

Formula (5) in both corrections apparently contains the proton mass. Under the root it is $\mathbf{m_p}$, while in the factor which is deducted it is **p** from formulas **(7a)**, **(7b),** i.e. logarithm for the base 2 of the ratio of the mass of the Universe and proton mass and the constant **k** from formula **(8)**, which also contains the constant **p**.

In both the corrections formula (6) contains the fundamental mass, defined by formula **(9)**. Under the root it is $\mathbf{m_f}$, while in the factor which is deducted it is **f** from formula **(10)**, i.e. the logarithm for the base 2 of the ratio of the mass of the Universe and fundamental mass. The coefficient accompanying $\mathbf{m_f}$ is the inverse fine-structure constant, while the one accompanying **f,** is pi, **π.** So, even though we have two corrections, it is just one physical state that is responsible for both the corrections.

By including the values into (6), we get:

x=0.666666666666667 **(11)**

Conclusion

I started from the assumption that the Koide formula misses parts, in order for the result to be ideal 2/3, and I managed to find solutions.

Of great importance is, I hope the widely-accepted view, that:

Parts are dependent on the whole (Universe) and are also an integral part of the whole, therefore, the whole is also dependent on the parts!

Let's call the above statement the "unity of whole and parts".

That's why the corrected Koide formula can be expressed in several ways. Since the Koide formula is famous first and foremost for its simplicity, here I would especially emphasize the formula (6), which has only the fundamental mass in the correction. The fact that in both the corrections key constants **π and ά** appear in a very simple way makes the formula even more significant.

Analysis of ways in which they appear, once with mass and once with the mass logarithm, could better explain the functioning of nature. It is evident that the fundamental mass defined through formula (9) has great importance in physics, which is only once more proved in formila (6).

The influence of the electron is dominant. The influence of the muon is by several orders of magnitude less frequent. The situation is even rarer for tau particle. Hence, even though it is currently impossible to determine the formula accurately, we can say with certainty that formula (6) is correct with all the significant digits presented above in (11).

In article [7] I showed that the universal gravitational constant was obtained by **the "unity of whole and parts"** method, even more accurately than the CODATA methods. The problem of not knowing the exact values of the mass and Cycle of the Universe was solved in my previous viXra articles by the multitude and accuracy of non-dimensional relations obtained through consistent application of the method. Values $\mathbf{M_u}$=1.739449*10^{53} and $\mathbf{T_u}$=4.30849 *10^{17} sec had been used much earlier than for the purpose of the Koide formula in [3], for example in [4], and those indeed are the values appearing most frequently in the literature.

For those who believe only in the experimentally obtained physical values, we still have formula (3), so let's show its extended version (12), where **x=f(m_e,m_μ,m_τ, μ,ά)**.

$$x=(m_e+m_\mu+m_\tau)/(\sqrt{\mu*2^{-2*[2-1/(\mu/\alpha'+2)]/3}*m_e/(2\pi\alpha')}+\sqrt{m_\mu}+\sqrt{m_\tau})^2-$$
$$-1/\{\pi*[e^{2\pi}/4+\log_2(2\pi)/2-1/3+1/(6\mu/\alpha'+12)]\}=2/3 \qquad \textbf{(12)}$$

If the above-mentioned people are also skeptics, they can also consider (12) a coincidence or even numerology. Then, for them the "**unity of whole and parts**", the basis for obtaining (12), does not apply.

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References:

[1]http://en.wikipedia.org/wiki/Koide_formula
[2]http://physics.nist.gov/cuu/Constants/
[3] Branko Zivlak, Improving the Koide Formula, viXra:1308.0080
[4] Branko Zivlak, Fine Structure Constant And Relations Between Dimensionless Constants, viXra:1301.0139
[5] Branko Zivlak, "Fundamental particle", http://viXra.org/abs/1312.0141
[6] Weinberg, S,. -Gravitation and Cosmology, John Wiley and Sons, New York, 1972.
[7] Branko L Zivlak, Towards Exact Value of Universal Gravitational Constant, http://gsjournal.net