the general science journal

www.wbabin.net/physics/fitzgerald13.pdf

IN COMPLEX MATH, ARE PREFIXES *i* and *j* THE SAME?

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To my dear wife, Velma, with all my love, gratitude, and devotion

ABSTRACT: In complex math, both *i* and *j* are equal to $[-1]^{-2}$. I consider *j* math of Electronics [and Electrical Engineering] to be more explanatory than *i* math of Physics and for *j* to have absolutely no connotation of imagination but that of reactance.

Fact is, in Electronics, a complex equation has applied a *j* prefix to a reactive component math term signifying at a glance the component has a 90° phase relationship of AC voltage to AC current within that component, if there is no resistance within that component. If there is resistance in the component, then the term itself becomes complex.

In an AC circuit, which can be parallel, series, or combinations, each component has an AC current thru it as a result of an AC voltage across it. If the component is a pure resistance, the voltage across and current thru are at 0° phase at any frequency. It also means there is no reactance associated with that resistance and thus no *j* prefix to that resistance math term.

The *j* in Electronics math identifies a component as either capacitive reactance via [-*j*] or inductive reactance via [+*j*].

Therefore, in a series AC circuit containing 3 terms, real resistance, inductive reactance, and capacitive reactance, the total impedance, z, is:

1. $z = a + [+j]b + [-j]c$ {For a proper identification of z, it must be identified as having some phase angle between the AC current and the AC voltage. In other words, some power factor, unless b and c are equal as in a resonant circuit.}

{In a parallel circuit, an additional factor must be added to the equation to reach the proper z.

That factor is called q.}

Both b and c are themselves complex consisting of reactance and resistance, which mainly applies to an inductor, b. In c, the resistance of the capacitor most likely can be neglected, because, the capacitance to resistance ratio is usually very great. Any inductor has a finite resistance which should not be neglected to be precise.

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The reader's attention has been drawn to the significant difference between *i* and *j* in complex math so as to aim scientists off the imaginary path of *i* math and onto the "real" path of *j* math. Because, all of nature is in motion not steady state.

Had scientists grasped the significance of a complex math containing *j* instead of *i*, which many labeled *i* as imaginary, the subjects of frames of reference, motion, and spacetime, would not have devolved into the drastic criticism they are in now. One group of today's scientists say *c*, the velocity of light, is constant, while others say it is not constant. The others are making the same tragic error Einstein made with his "reality field".

Had Einstein viewed his "reality field" equations as containing a motion at Planck length, time, hence frequency, meaning quantum mechanics could then have been adequately applied, he would have been able to move along with a proper *j* math from his "reality field" to a theory of everything. Instead, he viewed spacetime as without frequency [without *j* math], hence nothing came of his "reality field". How many of today's scientists know of Einstein's "reality field"?

Planck had it right with his Planck length, Planck time, hence Planck frequency. With Planck frequency, quantum mechanics could have produced unforeseen results back then. My guess is, humans would be space explorers by now had Einstein's "reality field", over a half century ago, contained *j* math allowing an application of Planck length, time and frequency to a theory of everything.

In my view, a correct theory of everything is un-derivable without a complex math [containing *j*] of Planck's length, time and frequency.

I do this to draw attention to the evidence, **nothing in nature is steady state** where *i* math does apply without flaw. However, **all of nature is in motion** of one kind or another.

Oh! Yes? You can not see or measure the motion, it is not moving, you say! Try minds-eye viewing nature at the Planck scale. At that smallness, every "thing" is in violent motion via dimensional fluctuations of enormous magnitude. That is where Einstein's "reality field" ought to have begun so as to include *j* math of length, time, plus frequency, modulation, sidebands, resonance, rectilinear motion, etc., at that smallness and to go on from there. *J* math can handle all of that and do so without recourse to generation of equations containing imaginary numbers. Motion can be both real and reactive leading science to many explanations of nature where none now exist.