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Global and Local Quaternion Conformal Symmetries As Twin Roads to Special Relativity and Gravity DOUGLAS SWEETSER, quaternions.com — The real and complex numbers are treated as rank-0 tensors in physics. Both these numbers are subgoups of quaternions, a 4D division algebra. Quaternion will also be treated as rank 0 tensors not needing a metric tensor to form a square. Examine the real and imaginary conformal symmetries of the square, $f(q) = q^2$. If two observers agree to the real part of q^2, then the two form inertial observers. The phase of the square, 2 Re(q) Im(q), can be used to determine the precise relationship between the two observers. The real part of q^2 commutes with all other quaternions which may be why this is a global symmetry. If two observers agree to the imaginary part of q^2, that is consistent with all weak field tests of gravity to date as changes in time multiplied by changes in space cancel. While this is a happy approximate accident for the Schwarzschild solution of general relativity, it is worth studying if this is only what gravity is about, conformal symmetry for number theory, not solutions to tensor calculus differential equations. The phase symmetry is local because the imaginary part of quaternions do not commute globally.

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