Convergence and Divergence Across Classical Geometry, Physical Equivalence, and EMx Operator Dynamics: Circle–Square, Sphere–Cube, Pyramid Construction, and Energetic Invariants

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Abstract

This report analyzes the structural relations and divergences among several mathematical and physical systems: (1) squaring the circle, (2) cubing the sphere, (3) pyramid construction as a curvature–projection engineering method, (4) the EMx operator framework, (5) relativistic equivalence $E = mc^2$, and (6) the qubit versus EMx ternary state. The aim is to identify invariant structures, transition rules, and algebraic barriers that determine where exact equivalence is possible, where only approximation is possible, and where topological or operator-class mismatches enforce divergence. EMx provides a unified formalism using signed-zero ternary states, curvature, flux, normalization, symmetry, and no-clone constraints, enabling a common representation of geometric, physical, and informational processes.

1 Introduction

Many classical mathematical and physical problems appear unrelated: constructing a square with the same area as a circle, constructing a cube with the same volume as a sphere, deriving pyramid proportions, or relating mass and energy. Yet each problem expresses a *mapping* between incompatible or partially compatible geometric, energetic, or informational states.

EMx formalizes these mappings in terms of operators:

$$O_1, \ldots, O_{10}$$

and T-classes:

$$T_0 \text{ (neutral)}, T_1 \text{ (signed)}, T_2 \text{ (binary)}, T_3 \text{ (curvature)}, T_4 \text{ (exchange shell)}.$$

Convergence occurs when:

$$\mathcal{W}(A) = \mathcal{W}(B),$$

meaning the orbit classes match.

Divergence occurs when:

$$\mathcal{W}(A) \neq \mathcal{W}(B),$$

and normalization requires a residual stored in $\varnothing$ (NULL).

2 Circle → Square: Convergences and Divergences

2.1 Convergence: Both represent closed finite-area 2D manifolds

Circle area:

$$A_c = \pi r^2$$

Square area:

$$A_s = s^2.$$

Both are represented within EMx as:

$$O_4(O_3(r)) \in T_3 \quad \text{and} \quad O_5(s) \in T_2.$$

Convergence arises from:

$$O_6(\cdot): \text{ normalize area.}$$

2.2 Divergence: $\sqrt{\pi}$ resides in the NULL channel

$$s = r\sqrt{\pi}$$

requires a transcendental multiplier.

Thus:

$$\sqrt{\pi} \in \varnothing.$$

EMx expresses this as incompatible orbit classes:

$$\mathcal{W}(\text{circle}) \neq \mathcal{W}(\text{square}).$$

3 Sphere → Cube: Convergences and Divergences

3.1 Convergence: Both represent 3D finite-volume bodies

Sphere:

$$V_s = \frac{4}{3}\pi r^3.$$

Cube:

$$V_c = a^3.$$

In EMx:

$$O_3(r^3) \in T_4, \quad O_5(a^3) \in T_3.$$

3.2 Divergence: Cube root of π resides in the NULL channel

Equal-volume requires:

$$a = r\left(\frac{4\pi}{3}\right)^{1/3}.$$

Thus:

$$\left(\frac{4\pi}{3}\right)^{1/3} \in \varnothing.$$

4 Pyramid Geometry Under EMx

Pyramids encode a curvature–projection–exchange hybrid:

- base $\to T_2$ (planar projection),
- cross-sectional slope $\to T_3$ (curvature analogue),
- apex $\to T_0$ (singularity or convergence point),
- height $\to O_2$ (flux path),
- diagonal faces $\to O_3$ (curvature along slanted edges).

Many ancient pyramid proportions approximate constant ratios that appear in:

$$\pi,\ \phi,\ \sqrt{2},\ \sqrt{3}.$$

EMx expresses pyramid construction as:

$$O_3 \circ O_2 \circ O_5(T_2) \to T_4,$$

a transition between projection, curvature, and exchange shells.

5 Energetic Equivalence: $E = mc^2$ as Curvature–Flux Identity

Einstein's relation:

$$E = mc^2$$

is a mapping between mass density curvature and flux amplitude.

In EMx notation:

$$E = O_3(m) \cdot O_2(c^2),$$

where:

- O_3 handles curvature (energy stored in geometry),
- O_2 handles flux/propagation.

The equivalence describes a *domain swap*:

$$T_3(\text{mass geometry}) \leftrightarrow T_4(\text{energy flux}).$$

No divergence occurs here: curvature and flux belong to compatible orbit classes through O_4 closure.

6 Qubit vs EMx Ternary State

6.1 Qubit

A qubit is a complex 2-state superposition:

$$|\psi\rangle = \alpha|0\rangle + \beta|1\rangle.$$

It obeys:

$$|\alpha|^2 + |\beta|^2 = 1.$$

6.2 EMx Ternary State

EMx uses:

$$T_0 = \{-1, 0, +1\}$$

with signed-zero behavior and operator evolution.

Key features:

- deterministic update under operators O_1–O_{10},
- reversible trajectories enforced by Ω,
- remainder stored in $\varnothing$,
- compatibility with geometric curvature and flux processes.

6.3 Convergence

Both systems encode:

$$\text{state} + \text{phase} + \text{transformation rules.}$$

6.4 Divergence

A qubit is continuous and complex-valued. EMx ternary states are discrete with signed-zero semantics.

Thus they inhabit different orbit classes:

$$\mathcal{W}(\text{qubit}) \neq \mathcal{W}(T_0).$$

7 Unified Operator Perspective

Table of convergences:

System	Convergent EMx Operators
Circle $\leftrightarrow$ Square	O_3, O_4, O_5, O_6
Sphere $\leftrightarrow$ Cube	$O_3, O_4, O_5, O_6, O_{10}$
Pyramid Geometry	O_2, O_3, O_5, O_6, O_7
$E = mc^2$	O_2, O_3, O_4
Qubit Analogue	O_1–O_{10}, T_0–T_4

Table of divergences:

System	Divergence Source
Circle $\to$ Square	$\sqrt{\pi} \in \varnothing$
Sphere $\to$ Cube	$\sqrt[3]{\pi} \in \varnothing$
Pyramid Ratios	transcendental approximants
Qubit vs EMx	incompatible topologies

8 Conclusion

Across classical geometry, modern physics, and informational theory, EMx provides a unified framework that identifies:

- which mappings preserve orbit class (convergence),
- which require NULL-channel remainders (divergence),
- which transformations require curvature or flux operators,
- which mappings are exact (e.g., $E = mc^2$),
- which mappings are approximative (e.g., circle $\rightarrow$ square).

Pyramids serve as structural exemplars of mixed curvature, projection, and exchange, connecting ancient engineering with EMx operator dynamics.