Fractal Universe Theory – Gravity Mathematics Appendix

# 1. Core ψ Field Definition

The gravitational emergence field ψ(r) defines the manifestation strength at radius r:  
  
ψ(r) = K / rⁿ + Σ shell terms  
  
Where:  
- K is the emergence strength constant  
- n is the collapse falloff exponent (e.g., 2.3)  
- Shells reinforce ψ recursively at radii rn = r₀·φⁿ with φ = 1.618

# 2. Emergence Gradient

The gradient of ψ gives the gravitational emergence pull:  
  
∇ψ(r) = -dψ/dr  
  
This represents the rate of manifestation curvature and replaces classical force.

# 3. Volocity Prediction (Galaxy Scale)

Apparent orbital velocity v\_obs is a result of emergence frequency:  
  
v\_obs² ∝ ∇ψ(r)  
  
Thus, volocity emerges from the collapse structure of the ψ field.

# 4. Lensing Angle Prediction

Light appears deflected due to ψ emergence field gradients:  
  
θ\_FUT = α · |∇ψ(b)|  
  
Where:  
- b is the impact radius (in kpc)  
- α is the projection coupling constant calibrated to data (~0.001)  
  
No spacetime curvature or c² is required.

# 5. Polarity Collapse Rule

If ∇ψ(r) > threshold, the field commits to manifestation and repelling potential is removed:  
  
ψ\_net(r) = ψ\_raw(r) - ψ\_repel(r), if ∇ψ > threshold  
ψ\_net(r) = 0, otherwise  
  
Where ψ\_repel(r) = scale · (1 / ψ(r))

# 6. Distance Illusion Correction (Optional)

General Relativity scales θ\_E by assuming spatial depth. To compare fairly with observed data, a geometric illusion multiplier can be applied:  
  
θ\_GR ≈ θ\_true · √(D\_L D\_S / D\_LS)  
  
FUT uses raw ψ emergence curvature without assuming real space.