🧪 MU Test Plan — Test 11 (β–ΔQ Phase Diagram)

Goal

Map **survival regimes** as a function of:

- **β** (Truth strength)
- **ΔQ = Q_fast – Q_slow** (action cost gap)

We'll visualize where the system shows:

- **Coexistence (near-degenerate)**: both branches sizable
- **Hierarchical coexistence**: slow dominates, fast suppressed but nonzero
- **Near-collapse of fast**: fast effectively negligible

Parameters

- $\hbar$ = 0.1
- γ = 1.0
- β sweep: 8.0 → 10.0 (step 0.25)
- ΔQ sweep: generated by varying fast-path slope (we'll produce a range that spans small to large ΔQ)
- Slow path: `r_slow(t) = 0.25*t`
- Fast paths: `r_fast(t) = offset + slope*t`, with `offset=0.6` and slopes in a list to span ΔQ
- Selector: $T(r) = 1/(1 + |r - 0.25|)$
- Window: 1.0

Predictions

- For **small ΔQ** and **moderate β**, **coexistence**: $w_{\text{fast}}/w_{\text{slow}} \sim O(1)$.
- As **ΔQ increases**, the **ratio drops exponentially**: $\log(w_{\text{f}}/w_{\text{s}}) \approx -\Delta Q/\hbar$ log(wf/ws)≈–ΔQ/$\hbar$ (Hierarchy Law).
- As **β increases**, absolute weights rise, but **ratios follow ΔQ/$\hbar$**, so **phase boundaries mostly vertical** in the (β, ΔQ) plane (weak β-dependence of ratio).

What to look for

- Heatmap of **log10(w_fast / w_slow)** with contour lines to separate regimes:
  - `≥ −1` (ratio ≥ 0.1): **coexistence**
  - `(−1, −4]`: **hierarchical coexistence**
  - `≤ −6`: **fast effectively collapsed**