In the name of God

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STATISTICAL FIELD THEORY AND CRITICAL PHENOMENA

Exercise Set 7

(Due Date: 1403/09/10)

1. RG recursive relation: For 1D and 2D Ising models, by doing the RG in coordinate space and deriving the general form of $[K]_\ell = \mathcal{R}_\ell[K]$, deduce the type of fixed points (attractive or repulsive).

2. Enumerate the properties of $\mathcal{R}_\ell[K]$ and β_ℓ from the critical phenomena points of view.

3. If in a RG transformation, the recursive equation is given by:

$$\frac{d}{d\ell}\begin{pmatrix} u \\ v \end{pmatrix} = \begin{pmatrix} \epsilon - 4(d+8)u & -24u \\ -48v & \epsilon - 36v \end{pmatrix}\begin{pmatrix} u \\ v \end{pmatrix}$$

here $\epsilon \equiv 4 - d$

A: Find all fixed points in the plane (u, v).

B: Draw the flow patterns for $d < 4$ and $d > 4$. Explain your results. (use the Mathematica streamplot command)

Good luck, Movahed