Abstract

We consider 3-colourings of the random d-regular graph on n labelled vertices. Call a colouring *balanced* if the number of vertices of each colour is equal, and *rainbow* if every vertex is adjacent to vertices of all the other colours. Using the small subgraph conditioning method, we give a condition on the variance of the number of rainbow balanced 3-colourings which, if satisfied, establishes that the chromatic number of the random 5-regular graph is asymptotically almost surely equal to 3.