Discrete Optimization

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Name:

1 Assignment - 10

Due: Thursday Dec. 1

1. **Use the max-flow min-cut algorithm to determine whether there is a matrix A such that**
   1. $A_{i,j} \geq 0$.
   2. $A \cdot \mathbf{j}^{Tr} \leq (13, 9, 4)^{Tr}$ **(j = (1,1,1))**
   3. $(1, 1, 1) \cdot A = (3, 7, 2)$
   4. $A_1 \leq (2, 0, 8), \quad A_2 \leq (3, 8, 3), \quad A_3 \leq (0, 13)$
2. **Can you construct a 5-regular graph that has no triangles with chromatic number 3?**
3. **Let G be a graph whose vertices are the seven triples forming the Fano plane and the integers $1, 2, \ldots 7$ (a total of 14 vertices). Connect i by an edge to the triples containing i. Color the edges of this graph by 3 colors.**
4. **Prove that the edges of a bipartite graph G can be colored by $\Delta(G)$ colors.**