UCA Universidad de Cádiz

Programa de Doctorado en Matemáticas

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Theory of Roman domination in graphs

a cargo de

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Abstract: Motivated by an article in Scientific American by Ian Stewart entitled "Defend the Roman Empire!", we explore a new strategy of defending the Roman Empire that has the potential of saving the Emperor Constantine the Great substantial costs of maintaining legions, while still defending the Roman Empire. In graph theoretic terminology, let G be a graph with vertex set V and edge set E. Each vertex represents a location in the Roman Empire. A location v is considered *unsecured* if no legions are stationed there ($f(v) = 0$) and *secured* otherwise ($f(v) \in \{1, 2\}$). An unsecured location v can be secured by sending a legion to v from an adjacent location (an adjacent vertex u). Emperor Constantine decreed that a legion cannot be sent from a secured location to an unsecured location if doing so leaves that location unsecured. Thus, at least two legions must be stationed at a location ($f(v) = 2$) before one of the legions can be sent to an adjacent location. In this way, it can be defended the Roman Empire. Since it is expensive to maintain a legion at a location, the Emperor would like to station as few legions as possible, while still defending the Roman Empire. A Roman dominating function of weight $\gamma_R(G)$ corresponds to such an optimal assignment of legions to locations.

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