PROBLEMS AND SOLUTIONS

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This section contains problems that challenge students and teachers of college mathematics. We urge you to participate actively by submitting solutions and by proposing problems that are new and interesting. To promote variety, the editors welcome problem proposals that span the entire undergraduate curriculum.

Proposed problems should be sent to **Curtis Cooper**, either by email as a pdf, TEX, or Word attachment (preferred) or by mail to the address provided above. Whenever possible, a proposed problem should be accompanied by a solution, appropriate references, and any other material that would be helpful to the editors. Proposers should submit problems only if the proposed problem is not under consideration by another journal.

Solutions to the problems in this issue should be sent to **Shing So**, either by email as a pdf, TEX, or Word attachment (preferred) or by mail to the address provided above by April 15, 2009.

PROBLEMS

891. *Proposed by William P. Wardlaw, U. S. Naval Academy, Annapolis, Maryland.*

Let V be an n dimensional vector space over the q element finite field F_q. Show that the r nonzero vectors in V can be listed in order $\overline{v}_1, \overline{v}_2, \dots, \overline{v}_r$ such that for any positive integer k, $(\overline{v}_k, \overline{v}_{k+1}, \dots, \overline{v}_{k+n-1})$ (interpreting subscripts modulo r) is an ordered basis for V.

892. *Proposed by Greg Oman, The Ohio State University, Columbus, Ohio.*

Find all rings R (not assumed to be commutative or to contain an identity) with the following two properties:

(i) not every element of R is nilpotent, and
(ii) $x^2 = y^2$ for any nonzero $x, y \in R$.

893. *Proposed by Ovidiu Furdui, University of Toledo, Toledo, Ohio.*

Let f be any function that has a Taylor series representation at 0 with radius of convergence 1, and let

$$T_n(x) = f(0) + \frac{f'(0)}{1!}x + \cdots + \frac{f^{(n)}(0)}{n!}x^n$$