PROBLEMS AND SOLUTIONS

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This section contains problems intended to challenge students and teachers of college mathematics. We urge you to participate actively *both* 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, no later than June 15, 2011.

PROBLEMS

946. *Proposed by Greg Oman, Ohio University, Athens OH.*

Let X be a countably infinite set and $f\colon X \to X$ a function. A subset $S \subseteq X$ is said to be closed under f provided that for all $x \in S$, also $f(x) \in S$. Suppose that every proper subset of X which is closed under f is finite. Show that there is an enumeration of the elements of X, say:

$$x_0,\ x_1,\ x_2,\ x_3,\ \ldots$$

such that for all $n > 0$, $f(x_n) = x_{n-1}$.

947. *Proposed by Ovidiu Furdui, Cluj, Romania.*

Find all nonconstant polynomials P and Q such that

$$\prod_{i=1}^{n} P(i) = Q\left(\prod_{i=1}^{n} i\right),$$

for all integers $n \geq 1$.

948. *Proposed by Duong Viet Thong, National Economics University, Hanoi City, Vietnam.*

Let $f\colon [a,b] \to \mathbb{R}$ be a continuously differentiable function such that $\int_a^b f(x)\,dx = 0$. Prove that

$$\left|\int_a^x f(t)\,dt\right| \leq \frac{(x-a)(b-x)}{2} M,$$

for all $x \in [a,b]$, where $M = \max_{x\in[a,b]} |f'(x)|$.

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