Focus On . . . Index

Algebra

25 The Long Division of Polynomials

43:1 (Jan 2017) 16-20
The division algorithm for polynomials can provide the key to solving a variety of algebra problems.

26 Degree and Roots of a Polynomial

43:5 (May 2017) 205-209
The focus here is on the links between the degree of a polynomial and the number of its roots.

30 Cauchy's Functional Equation

44:3 (Mar 2018) 106-109
Solutions to problems involving functional equations often come down to an application of known results about Cauchy's equation. A selection of problems illustrate the various properties under consideration.

Inequalities

5 Inequalities via Lagrange Multipliers

39:1 (Jan 2013) 24-26
A few examples of problems requiring the proof of a constrained inequality where, with some care, the method of Lagrange Multipliers leads to a simple solution.

20 Inequalities via Complex Numbers

42:1 (Jan 2016) 20-23
Geometric and algebraic inequalities follow from familiar properties of the modulus of a complex number.

23 Vieta's Formulas

42:7 (Sep 2016) 303-307
(See under Algebra.)

40 Inequalities via Auxiliary Functions (I)

46:3 (Mar 2020) 117-122
We illustrate through examples how to verify a given inequality by choosing an appropriate auxiliary function, then using calculus.

Geometry

Calculus

5 Inequalities via Lagrange Multipliers

39:1 (Jan 2013) 24-26

(See under Inequalities.)

10 Some Sequences of Integrals

40:1 (Jan 2014) 21-24

A study of the sequences $I_n = \int_0^1 (ax^2 + bx + c)^n dx$ with the goal of finding a sequence (ω_n) such that $\lim_{n\to\infty} = \frac{I_n}{\omega_n} = 1$.

11 The Partial Sums of Some Divergent Series

40:3 (Mar 2014) 112-115

For a sequence (a_n) of positive real numbers such that $\lim_{n\to\infty} = \frac{a_{n+1}}{a_n} = \omega > 1$, and the corresponding sequence of its partial sums $A_n = \sum_{k=1}^{n} A_k$, we establish a few results about the behavior of the sequences (A_n) and $\left(\frac{A_{n+1}}{A_n}\right)$ in comparison with the sequences (a_n) and $\left(\frac{a_{n+1}}{a_n}\right)$ and offer some applications.

15 A Formula of Euler

41:1 (Jan 2015) 16-20

(See under Algebra.)

30 Cauchy's Functional Equation

44:3 (Mar 2018) 106-109

(See under Algebra.)

31 Mean Value and Rolle's Theorems

44:5 (May 2018) 202-206

The Mean Value Theorem establishes a link between a function and its derivative. Here we will see it at work in various problems, sometimes rather unexpectedly.

35 The Asymptotic Behavior of Integrals

45:3 (Mar 2019) 137-143

We keep the same goal as in Number 10 [2014: 21-24] (namely, to determine the asymptotic behavior of a given sequence of integrals), but here, restricting ourselves to elementary problems and methods, present simple ways to obtain such an asymptotic behavior.

Combinatorics

15 A Formula of Euler

Trigonometry

34 Some Trigonometric Relations

We consider a selection of problems involving the values of the circular functions at $\frac{m\pi}{n}$ for various natural numbers m and n. Solutions depend on complex numbers and polynomials in addition to the classical trigonometric identities.

Solutions to Exercises