Student Problems

Students up to the age of 19 are invited to send solutions to either or both of the following problems to Tuya Sa, SCH.1.17, Schofield Building, Loughborough University, Loughborough, LE11 3TU. Two prizes will be awarded – a first prize of £25, and a second prize of £20 – to the senders of the most impressive solutions for either problem. It is not necessary to submit solutions to both. Solutions should arrive by 20th September 2023 and will be published in the November 2023 edition.

The Mathematical Association and the *Gazette* comply fully with the provisions of the 2018 GDPR legislation. Submissions must be accompanied by the SPC permission form which is available on the Mathematical Association website

> https:www.m-a.org.uk/the-mathematical-gazette

*Note that if permission is not given, a pupil **may still participate and will be eligible for a prize in the same way as others**.*

Problem 2023.3 (Gregory Dresden)

Show, without using series, that

$$\lim_{n \to \infty} \left(\cot \frac{x}{n+1} - \cot \frac{x}{n-1} \right) = \frac{2}{x}.$$

Problem 2023.4 (Paul Stephenson)

Show that the sum of the divisors of a positive integer (including 1 and the number itself) divides the sum of their cubes.