

Working time: 60 minutes

The derivation of the results must be given clearly. The statement of the result only is not sufficient.

Tools:

- pocket calculator (according to the instructions of FWW)
- **either** one individually prepared one-sided A4 sheet of paper with arbitrary material (write '1' on cover sheet) **or** textbook 'Mathematics of Economics and Business (write 'B' on cover sheet)

It is not allowed to use mobile phones.

Problems:

- (a) An arithmetic sequence has the first term $a_1 = \frac{20}{3}$, the constant difference $d = \frac{8}{3}$ and for some n the partial sum $s_n = 896$. Determine the corresponding value of n and the term a_n .
(b) Check by means of the quotient criterion whether the series

$$\sum_{n=1}^{\infty} \frac{2^{n-1}}{3^n \cdot n^3}$$

converges.

(12 points)

- (a) Given are the functions

$$f : [0, 6] \rightarrow R_f \quad \text{with} \quad f(x) = 4x - 1$$

and

$$g : [-2, 2] \rightarrow R_g \quad \text{with} \quad g(x) = \sqrt{8 - x^3}.$$

Determine the ranges R_f and R_g of the functions f and g as well as the composite functions $f \circ g$ and $g \circ f$ provided that they exist.

- (b) Determine

$$\lim_{x \rightarrow 3+0} \frac{\ln(2x - 5)^2}{\sqrt{x^2 - 9}}.$$

(12 points)

- Given is the function $f : \mathbb{R}_+ \rightarrow \mathbb{R}$ with

$$f(x) = \frac{40x}{1 + x^2}.$$

- Determine all local extreme points of function f and their type.
- Determine all monotonicity intervals of function f .
- Determine all $x \in D_f$ for which function f is convex.
- Check whether the function f is elastic for some $x \in D_f$.

(19 points)

4. Using integration by substitution, find

$$\int \frac{\sqrt[3]{x}}{1 + \sqrt[3]{x}} dx.$$

(7 points)