Sample problems for credit tests

1. Compute the following limit of a sequence:

$$\lim_{n\to\infty} \frac{\log[\sqrt{n}]}{\log[\sqrt[3]{n}]} \qquad ([..] \text{ denotes the integer part.})$$

2. Compute the following limit:

$$\lim_{x\to+\infty} x^2 \cdot \left(\sqrt{x^2 + \sin\frac{1}{x}} - x\right)$$

3. Compute the derivative of the function

$$f(x) = (\operatorname{arctg} x)^{x^2 \log x}$$

at all points, where it exists.

4. Compute first-order partial derivative of the function

$$f(x) = (x + y)^{x^2 y}$$

at all points, where they exist.

Remarks: Each test will contain three problems. These sample problems illustrate the approximate difficulty of the problems in the tests.