



Differential and Integral Calculus 1

MS-A0111

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Problem Sheet for Week 38 (B), 2021



NOTE¹

The due date is published on the course pages. Homework can be submitted only digitally. Instructions on labelling the “papers” can be found on the course pages.

1 Introductory Problems

INTRO 5 Classify the critical points of the function $y = x \ln x$.

INTRO 6 Find the equation of the straight line of maximum slope tangent to the curve $y = 1 + 2x - x^3$.

2 Homework Problems

EXERCISE 5 Let f and g be twice differentiable functions for which the identity

$$af(x)g(x) + bf(x) + cg(x) + d \equiv 0,$$

where a , b , c , and d are constants, holds. Let further f , f' , and the constants a and c be positive. Show, that under certain condition

$$D \ln \frac{f'(x)}{g'(x)} = k \sqrt{f'(x)g'(x)},$$

where k is constant. What is the condition, and the value of k ?

EXERCISE 6 One of the corners of a given rectangle is the point P on the curve

$$(ax)^{2/3} + y^{2/3} = b^{2/3}$$

¹Published on 2021-09-08 08:52:08+03:00.

and the other three are the symmetric points of P about the coordinate axes and the origin. Find the extremal values of the area of the rectangle when P moves along the curve.

Answer: $\text{Max } \frac{2a}{b}$, when $P \equiv (\frac{2\sqrt{2a}}{b}, \frac{2\sqrt{2a}}{b})$; $\text{min } 0$, when P is on the coordinate axis.