



Differential and Integral Calculus 1

MS-A0111

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Problem Sheet for Week 39 (A), 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 7 Write the indicated case of Taylor’s formula for the given function. What is the Lagrange remainder in this case?

$$f(x) = \sin x, \quad a = \pi/4, \quad n = 4.$$

INTRO 8 Find the n th-order Maclaurin polynomial of

$$f(x) = \frac{1}{1 - x^2}$$

using the alternative definition of the Taylor polynomial.

2 Homework Problems

EXERCISE 7 Find the Maclaurin series of $g(\theta) = e^{\sin \theta}$. Explain carefully every intermediate result used in the derivation of the series.

EXERCISE 8 In a computer game the magical powers of wizards are modelled as electric charges (a negative charge $-Q$ for the dark wizards

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and a positive one for the light wizards). Hence, when two wizards of opposite camps meet and stand a distance r apart, that is, they form a magical dipole, a magical field is induced. Our hero (you?) stands at the point P at a distance R from the magical dipole, and experiences the magical field E as

$$E = \frac{Q}{R^2} - \frac{Q}{(R+r)^2}.$$

Show that when R is large in comparison to r , the magical field is approximately proportional to $1/R^3$.

(This is a classical application of series.)