Differential and Integral Calculus 1
MS-A0111
Hakula
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Problem Sheet for Week 39 (B), 2021

NOTE[1]

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 9 Test whether the following series converges

$$\sum_{n=1}^{\infty} \frac{1}{n^3+1}.$$

INTRO 10 Show that the radius of convergence of the series with the following coefficients is infinite

$$a_n = (-1)^{n-1} \frac{x^{2n-1}}{(2n-1)!}.$$

2 Homework Problems

EXERCISE 9 Show that the following series converges

$$\sum_{n=1}^{\infty} \frac{1}{n!}.$$

EXERCISE 10 A ball is dropped from a height of 10 metres and bounces. Each bounce is $3/4$ of the height of the bounce before.

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(a) Find an expression of the total vertical distance the ball has travelled when it hits the floor for the n^{th} time. Express your answer in closed form.

(b) Show that the ball dropped from a height of h metres reaches the ground in $\sqrt{\frac{h}{5}}$ seconds. (Assume $g = 10m/s^{-2}$).

(c) Show that the ball stops bouncing after approximately 19 seconds.