MA211 Calculus I – Assignment 3

November 7, 2016, Lecturer: Claas Röver

Hand in your solution at the <u>beginning</u> of the lecture on **Wednesday, 16 Nov 2016**.

QUESTION 1. For each of the following series, calculate its sum or show that it diverges.

$$\text{(a)} \sum_{n=1}^{\infty} \frac{n^3 - 1}{2n^3 + 1} \qquad \text{(b)} \sum_{n=1}^{\infty} \frac{3^{n-1}}{4^{n+1}} \qquad \text{(c)} \sum_{n=2}^{\infty} \frac{1}{n^2 - 1}$$

QUESTION 2. For each of the following series, decide whether it converges or diverges.

$$\text{(a)} \sum_{n=1}^{\infty} \frac{1}{2^n(n+1)} \qquad \text{(b)} \sum_{n=1}^{\infty} \frac{(2n)!}{(n!)^3} \qquad \text{(c)} \sum_{n=1}^{\infty} \frac{2^n}{3^n - n^3}$$

QUESTION 3. Find the general solution of each of the following separable differential equations.

$$\text{(a)} \ \frac{dy}{dt} = 1 + y^2 \qquad \text{(b)} \ \frac{dy}{dt} = t^2 y^2 \qquad \text{(c)} \ \frac{dy}{dx} = e^y \sin(x)$$

QUESTION 4. Find the general solution of each of the following differential equations by making them separable with the substitution $y = zt$.

$$\text{(a)} \ t^2 \frac{dy}{dt} - yt = y^2 \qquad \text{(b)} \ \frac{dy}{dt} = \frac{2ty + y^2}{t^2}$$

QUESTION 5. Find the general solution of each of the following first order linear differential equations.

$$\text{(a)} \ x\frac{dy}{dx} - 3y = x^4 \qquad \text{(b)} \ \frac{dy}{dt} + y = e^t \qquad \text{(c)} \ \frac{dy}{dt} + 2ty = t^3$$