# Math 8: Calculus in one and several variables Spring 2018 - Homework 2 

Return date: Wednesday 04/11/18
keywords: ratio test, diff. and int. of power series, Taylor series
Instructions: Write your answers neatly and clearly on straight-edged paper, use complete sentences and label any diagrams. Please show your work; no credit is given for solutions without work or justification.
exercise 1. (6 points) Determine whether the following series are convergent or not.
a) $\sum_{n=2}^{\infty} \frac{n^{3}+3 n^{2}+2 n}{7 n^{3}+4 n+1}$.
b) $\sum_{n=10}^{\infty} \frac{(-7)^{n}}{n^{3}}$.
c) $\sum_{n=1}^{\infty} \frac{(3 n)!}{(n!)^{2}}$.

Explain how you have obtained your answer.
exercise 2. (4 points) Determine the radius of convergence for the following series.
a) $\sum_{n=0}^{\infty} \frac{n^{4}}{9^{n}}(x-7)^{n}$.
b) $\sum_{n=0}^{\infty} \frac{(-1)^{n}}{5^{n} \cdot n^{1 / 3}}(3 x-2)^{2 n}$.

Explain how you have obtained your answer.
exercise 3. (6 points) Find power series representation for the following functions and determine the radius of convergence.
a) $f(x)=\frac{2}{1-5 x^{3}}$.
b) $f(x)=\frac{1}{(1+x)^{2}}$.
c) $f(x)=x^{2} \cdot \arctan \left(x^{3}\right)$.

Justify your answer.
exercise 4. (1 points) Use the definition of Taylor and Maclaurin series to compute the terms up to degree 4 of the Maclaurin series for $f(x)=\frac{1}{(1+x)^{2}}$ and compare with your answer to exercise 3b).

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exercise 5. (3 points) Find the sums of the following series by associating them to a Taylor series.
Hint: Look at Table 1 on page 808 of the book.
a) $\sum_{n=0}^{\infty} \frac{x^{5 n+3}}{n!}$.
b) $\sum_{n=0}^{\infty} \frac{(-1)^{n}}{(2 n+1)!}$.
c) $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n}$.

Justify your answer.

