University of South Carolina

Midterm Examination 3   November 20, 2018

Math 142–H01

Closed book examination   Time: 75 minutes

Name _____

Instructions:

No notes, books, or calculators are allowed. If you need more space than is provided use the back of the previous page and clearly indicate you have done so. Simplify your final answers. **Full credit may not be awarded for insufficient accompanying work.**

1		12
2		9
3		6
4		8
5		6
6		9
Total		50

1. (12 points) For each of the following functions:

  - write down the Maclaurin series using Σ notation, and

  - write down the radius of convergence.

(You do not need to justify your answers.)

  (a) e^x

  (b) $\cos(x)$

  (c) $(1+x)^{\frac{1}{3}}$

  (d) $\ln(1+x)$

2. (9 points) For each of the following series, determine if it converges or diverges.

(a) $\displaystyle\sum_{n=0}^{\infty} \frac{2^n}{n^n}$

(b) $\displaystyle\sum_{n=1}^{\infty} \frac{n+2}{(2n)!}$

(c) $\displaystyle\sum_{n=3}^{\infty} \frac{n^2 + 2n - 1}{n^4 - 2n + 3}$

3.   (6 points) Determine the Taylor polynomial of order 3 generated by the function $f(x) = \tan(x)$ at $a = \pi$.

4. (8 points) Determine the interval of convergence for the power series

$$\sum_{n=1}^{\infty} \frac{(4x-5)^n}{3n+1} \ .$$

5. (6 points)

  (a) Estimate $\sqrt{6}$ using the Taylor polynomial of order 2 for $f(x) = \sqrt{x}$ at $a = 4$.

  (b) Find an upper bound on the absolute value of the error for the estimate from (a) using the Remainder Estimation Theorem.

6. (9 points) Find the following:

    (a) The Taylor polynomial of order 34 generated by $f(x) = x^{10}\cos(x^5)$ at $a = 0$.

    (b) $\displaystyle\sum_{n=0}^{\infty} \frac{(-2)^n}{(2n)!}$

    (c) $\displaystyle\lim_{x\to 0} \frac{6\sin(x) - 6x + x^3}{x^5}$

The End