University of South Carolina

Midterm Examination 3 October 20, 2016

Math 142 Section H03

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		8
2		8
3		8
4		10
5		8
6		8
Total		50

1. (8 points) For each of the following functions:

   - write down the Maclaurin series using Σ notation, and
   - write down their interval of convergence.

(You do not need to justify your answers.)

(a) e^x

(b) $\sin(x)$

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

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

2. (8 points) Determine the Taylor polynomial of order 4 generated by the function $\cos^2(x)$ at $x = \pi$.

3. (8 points) Determine the interval of convergence for the power series

$$\sum_{n=0}^{\infty} \frac{(x-5)^n}{2n+1} .$$

4. (10 points)

(a) Using the Taylor polynomial of order 2 generated by the function $f(x) = \sqrt{x}$ at $x = 4$, estimate the value of $\sqrt{5}$.

(b) What is the maximum value of $|f^{(3)}(x)|$ on the interval $[4, 5]$?

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

5. (8 points) Find the following:

(a) $\lim_{x \to 0} \dfrac{\tan^{-1}(x) - x}{\sin(x) - x}$

(b) $\sum_{n=0}^{\infty} \left(\dfrac{1}{3}\right)^n$

(c) $\sum_{n=0}^{\infty} \dfrac{4^n}{n!}$

6. (8 points) Use the Taylor polynomial of order 3 generated by $\sin(x)$ at $x = 0$ to estimate

$$\int_0^3 \frac{\sin(2x)}{x}\, dx \ .$$

The End