Math 162: Calculus IIA

Final Exam

December 16, 2014

NAME (please print legibly): ______________________________

Your University ID Number: ______________________________

Indicate your instructor with a check in the box:

JJ Lee	MWF 9:00 - 9:50 AM	
Doug Ravenel	MWF 10:25 - 11:15 AM	
Geordie Richards	MW 12:30 - 1:45 PM	
Andrew Bridy	MW 4:50-6:05 PM	

- **The presence of calculators, cell phones, iPods and other electronic devices at this exam is strictly forbidden. IF YOU HAVE YOUR PHONE WITH YOU, YOU MUST TURN IT IN TO A PROCTOR BEFORE STARTING THE EXAM. FAILURE TO DO SO WILL BE TREATED AS AN ACADEMIC HONESTY VIOLATION.**
- **Show your work and justify your answers. You may not receive full credit for a correct answer if insufficient work is shown or insufficient justification is given.**
- **Put your answers in the space provided at the bottom of each page or half page.**
- **You are responsible for checking that this exam has all 17 pages.**
- **Part A covers the same material as the two midterms, and Part B covers additional material. Letter grades will be computed for the two parts separately. Part B will count for 20% of your course grade. It has the same weight as a midterm exam grade.**
- **Part A will count for at least 10% of your course grade. If your grade on part A is better than your lowest midterm exam grade, then it will replace that midterm exam grade and count for 30% of your course grade.**
- ***Have a nice winter break!***

Part A		
QUESTION	VALUE	SCORE
1	20	
2	15	
3	15	
4	20	
5	15	
6	15	
TOTAL	100	

Part B		
QUESTION	VALUE	SCORE
7	20	
8	20	
9	20	
10	20	
11	20	
TOTAL	100	

Part A

1. (20 points) Evaluate the integral

$$\int \frac{x^2}{\sqrt{4-x^2}}\,dx.$$

ANSWER:

2. (15 points)

Find the volume of the solid obtained by rotating the region bounded by the curves $y = \sqrt{x}$, $x = 0$, and $y = 1$ about the line $y = 2$.

ANSWER:

3. (15 points) Evaluate the integral

$$\int \sin(x)\cos(x)e^{\sin x}\,dx.$$

ANSWER:

4. (20 points)

(a) Find the partial fraction expansion of

$$\frac{1}{x^3 - 4x^2 + 4x}$$

ANSWER:

(b) Evaluate the integral

$$\int \frac{1}{x^3 - 4x^2 + 4x}\,dx.$$

(If your answer for part (a) is wrong, you will not receive credit for evaluating the integral of an incorrect function.)

ANSWER:

5. (15 points)

Find the arc length of the parametric curve $x(t) = e^t \cos t$, $y(t) = e^t \sin t$ connecting the point $(1, 0)$ to the point $(-e^\pi, 0)$.

ANSWER:

6. (15 points)

Use the area formula in polar coordinates to find the area of the region that is both inside the circle $x^2 + y^2 = 4$ and to the right of the line $x = 1$.

ANSWER:

Part B

7. (20 points)

(a) Find a power series representation centered at 0 of the function as well as the radius and interval of convergence.

$$f(x) = \frac{x}{2 + x^2}$$

ANSWER:

(b) Write the following function as a power series in x. What is the radius of convergence of this power series?

$$\frac{d}{dx}\left(\frac{x}{2+x^2}\right)$$

ANSWER:

8. (20 points)

Find the radius of convergence and interval of convergence of the series

$$\sum_{n=3}^{\infty} \frac{2^n (x+3)^n}{2n+1}.$$

ANSWER:

9. (20 points)

Determine whether the series is absolutely convergent, conditionally convergent, or divergent.

$$\sum_{n=1}^{\infty} \frac{(-1)^n \cdot n}{(1+n^2) \cdot \tan^{-1} n}$$

ANSWER:

10. (20 points)

(a) Find the Taylor series centered at 0 of the function $\cos\sqrt{|x|}$, as well as radius and interval of convergence.

ANSWER:

(b) Write the integral

$$\int_0^x \cos\sqrt{|t|}\,dt$$

as a power series in x.

ANSWER:

11. (20 points)

(a) Determine whether the series

$$\sum_{n=0}^{\infty} a_n \sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)(2n+1)!}$$

is absolutely convergent, conditionally convergent, or divergent.

ANSWER:

(b) Estimate the sum of the series with an accuracy of $\frac{1}{100}$.

ANSWER: