Math 162: Calculus IIA

Second Midterm Exam

November 18, 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 11 pages.**

QUESTION	VALUE	SCORE
1	20	
2	20	
3	20	
4	20	
5	20	
TOTAL	100	

1. (20 points) The following are convergent series. Find the sum of the series (You don't need to justify the convergence of the series, but you should clearly show how you got the answer).

(a)

$$\sum_{n=1}^{\infty} \frac{1+3^n}{2^{2n}}$$

ANSWER:

(b)

$$\sum_{n=1}^{\infty} \frac{18}{n(n+3)}$$

ANSWER:

2. (20 points) (a) Find the area of the region that is inside the circle given by $r = 2\cos\theta$ and outside the circle given by $r = \sqrt{2}$ (both equations are in polar coordinates).

ANSWER:

(b) Compute the equation of the tangent line to the circle $r = 2\cos\theta$ at the point $\left(\frac{3}{2}, \frac{\sqrt{3}}{2}\right)$.

ANSWER:

3. (20 points) Determine whether the following series converge or diverge. Justify your answers, making sure to name the convergence test(s) that you are using.

(a)

$$\sum_{n=2}^{\infty} \frac{\ln(n)}{n^2} = \frac{\ln(2)}{4} + \frac{\ln(3)}{9} + \frac{\ln(4)}{16} + \cdots$$

ANSWER:

(b)

$$\sum_{n=2}^{\infty} \frac{n^3 - n^2}{n^3 + 1} = \frac{4}{9} + \frac{18}{28} + \frac{48}{65} + \cdots$$

ANSWER:

4. (20 points) Consider the curve

$$f(x) = \frac{x^4}{4} + \frac{1}{8x^2}.$$

(a) Calculate the arc length function $s(t)$ starting at $x = 1$, that computes the length of the curve from $(1, f(1))$ to $(t, f(t))$.

ANSWER:

(b) Calculate the arc length from $x = 2$ to $x = 4$.

ANSWER:

5. (20 points)

(a) Compute the area of surface of revolution obtained by rotating the curve $y = \sqrt{9 - x^2}$ around the x-axis.

ANSWER:

(b) Do the same for the curve $y = 1 - |x|$, $-1 \leq x \leq 1$.

ANSWER: