Math 132 **Final Exam** **Spring 2015**

Name: _____

ID Number: _____

Section Number: _____

Section	Instructor	Day/Time	Section	Instructor	Day/Time
1	Farelli	MWF 10:10	9	Benincasa	TuThu 1:00
2	Farelli	MWF 9:05	10	Benincasa	TuThu 2:30
3	Clark	MWF 11:15	11	Buskin	MWF 10:10
4	Clark	MWF 12:20	12	Yaping	MWF 12:20
5	Brown	MW 2:30	13	Yaping	MWF 1:25
6	Brown	MW 4:00	15	Buckman	TuThu 11:30
7	Duanmu	TuThu 8:30	16	Wen	TuThu 1:00
8	Oloo	TuThu 10:00	17	Wen	TuThu 2:30

- No calculators, papers, or notes may be used.
- Please don't just give an answer. Clearly explain how you get it, providing appropriate mathematical details.
- This is a 2 hour exam.

Question	Grade
MC Total	
6	
7	
8	
9	
Total (out of 100)	

Mutiple Choice Section: Choose the one option that best answers the question. There is no partial credit for questions 1-5.

1. [5 points] Find the Cartesian coordinate of the polar coordinate $(r, \theta) = (-\sqrt{2}, 5\pi/4)$.

   (a) $(1, 1)$

   (b) $(-1, -1)$

   (c) $(1, -1)$

   (d) $(-1, 1)$

2. [5 points] Which is not a possible result for a power series?

$$\sum_{n=0}^{\infty} c_n (x-a)^n$$

   (a) the series converges if $x = a$

   (b) the series converges for all x

   (c) the series converges when $| x - a | <$R

   (d) the series converges when $| x - a | >$ R

3. [5 points] Find the interval of convergence of the power series:

$$\sum_{n=1}^{\infty} n!(3x-1)^n$$

(a) $I = \{0\}$

(b) $I = (-\frac{1}{3}, \frac{1}{3}]$

(c) $I = \emptyset$

(d) $I = \{\frac{1}{3}\}$

4. [5 points] Eliminate the parameter to find the Cartesian equation for $x = 5\sin(t)$, $y = 2\cos(t)$.

(a) $\frac{x^2}{4} + \frac{y^2}{25} = 1$

(b) $\frac{x^2}{25} + \frac{y^2}{4} = 1$

(c) $x^2 + y^2 = 1$

(d) $x^2 + y^2 = 10$

5. [5 points] Convert the polar equation $3r\cos(\theta) + 4r\sin(\theta) = 1$ into a Cartesion equation.

(a) $3x + 4y = x^2 + y^2$

(b) $\frac{x}{3} + \frac{y}{4} = 1$

(c) $3x + 4y = 1$

(d) $3y + 4x = 1$

Please fill in your letter answer for questions 1-5 below:

(1) _____ (2) _____ (3) _____ (4) _____ (5) _____

Free Response Portion: Show all work for each of the following questions. Partial credit may be awarded for questions 6-9. You will receive no credit for an answer without supporting work.

6. (a) [5 points] Evaluate the integral.

$$\int x^2 \sin(x^3) dx$$

(b) [5 points] The Maclaurin series of $\sin(x) = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!}$.

Determine the Maclaurin series for

$$f(x) = 2x^3 \sin(2\pi x^2)$$

Simplify completely by combining all terms within the summation.

7. (a) [10 points] Find the interval of convergence of the series. Justify any test you use, and be sure to verify any necessary conditions.

$$\sum_{n=0}^{\infty}(-1)^n\frac{(5x-3)^n}{3n+2}$$

(b) [10 points] Represent the following function as a power series. Simplify completely by combining all terms within the summation.

$$f(x) = \frac{x^6}{(1-4x)^2}$$

8. Consider the curve given by the parametric equations

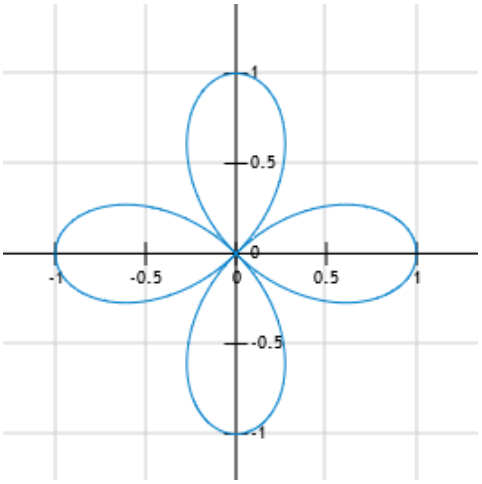
$$x = e^{\sin(t)} \qquad y = \cos(t) + t - \pi$$

$$0 \leq t \leq 2\pi$$

(a) [10 points] Find the equation of the tangent line to the curve at the point $(1, -1)$.

(b) [10 points] Find all the points where there is a vertical tangent line on the interval $0 \leq t \leq 2\pi$.

9. (a) [10 points] Find the area enclosed in all loops of the function $r = \cos(2\theta)$ given the graph of the function below. Mathematically justify how you find the integral bounds.



(b) [10 points] Find the slope of the tangent line for the function in part (a) $r = \cos(2\theta)$ at $\theta = \pi/4$.

(c) [5 points] Find the exact length of the curve $r = e^{3\theta}$ from $\theta = 0$ to $\theta = 2$.

This page is intentionally left blank for additional work.