MATH 009C **MIDTERM** **July 13, 2017**

Name: _____ **Score:** _____ / 100

Student ID: _____

DO NOT OPEN THE EXAM UNTIL YOU ARE TOLD TO DO SO

	1	2	3	4	5	Total
✓						
Score						
Pts. Possible	25	25	25	25	25	110

INSTRUCTIONS FOR STUDENTS

- You can use both sides of the paper for your solution. This is an **4** question exam.
- Students have **50** minutes to complete the exam.
- The test will be out of **100** points (4 questions). You may attempt a 5^{th} question, which will have a maximum of 10 possible points. The highest possible score is therefore **110** points.
- In the above table, the row with the ✓, is for you to keep track of the problems you are attempting/completing.
- You may complete parts of problems, as partial credit will be given based on correctness, completeness, and ideas that are leading to the correct solutions.
- **PLEASE SHOW ALL WORK**. Any unjustified claims will receive no credit.
- No notes, textbooks, phones, calculators, etc. are allowed for the exam.
- The last page of the test can be used for scratch work.

GOOD LUCK!

1) (25 pts.) Determine if the integral is convergent or divergent:

$$\int_1^\infty \frac{x}{x^3+1}\,dx.$$

2) (20 pts.) (a) Eliminate the parameter in the for the following parametric equation

$$x = 4\cos(t) + 2 \qquad y = 2\sin(t) + 1$$

(5 pts.) (b) Identify the type of graph from your result in part (a).

3) Consider the parametric defined as: $x = t - e^t, y = t + e^{-t}$

(10 pts.) (a) Compute $\dfrac{dy}{dx}$.

(10 pts.) (b) Compute $\dfrac{d^2y}{dx^2}$.

(5 pts.) (c) For which values of t is the curve concave upward?

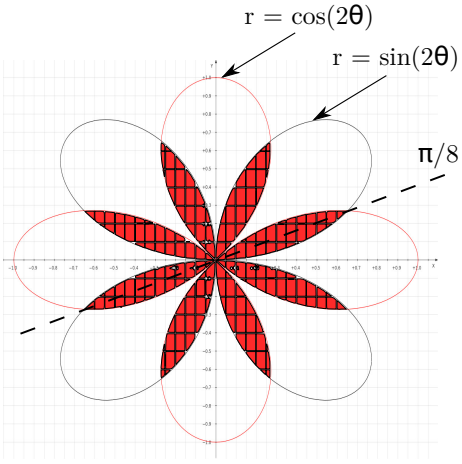
4) (10 pts.) (a) Consider the polar curve $r = 1/\theta$. Find the slope of the tangent line to the curve at the point $\theta = \pi$.

(15 pts.) (b) Consider the polar curve $r = 1 + \sin(\theta)$. Find the θ where the tangent line is vertical for $0 \leq \theta < 2\pi$. State which value of θ give $\dfrac{dy}{dx} = \dfrac{0}{0}$ (you do not need to compute the limit).

5) (25 pts.) Find the area of the region that lies inside the polar roses (the region is shaded in the labeled plot below).

$$r = \cos(2\theta)$$
$$r = \sin(2\theta)$$

Hint 1: Use the symmetry at $\frac{\pi}{8}$ *to simplify the integral. How many pieces do you really have?*
Hint 2: Identities that may be helpful: 1) $\sin^2(2\theta) = \frac{1}{2} - \frac{1}{2}\cos(4\theta)$, *2)* $\cos^2(2\theta) = \frac{1}{2} + \frac{1}{2}\cos(4\theta)$.



THIS PAGE IS LEFT BLANK FOR ANY SCRATCH WORK

END OF TEST