

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	10	10	10	10	10	45

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 **40** points (4 questions). You may attempt a 5th question, which will have a maximum of 5 possible points. The highest possible score is therefore **45** points.
- In the above table, the row with the ✓, is for you to keep track of the problems you are attempting/completing. Write a ✓ for the problems you want to be graded for credit, and EC for the extra credit problem.
- 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) (8 pts.) (a) Eliminate the parameter for the following parametric equations

$$x = 2 \sin(t) \quad y = 5 \cos(t)$$

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

2) Consider the parametric equations defined as: $x = \sin(t)$, $y = -\cos(t)$

(3 pts.) (a) Compute $\frac{dy}{dx}$.

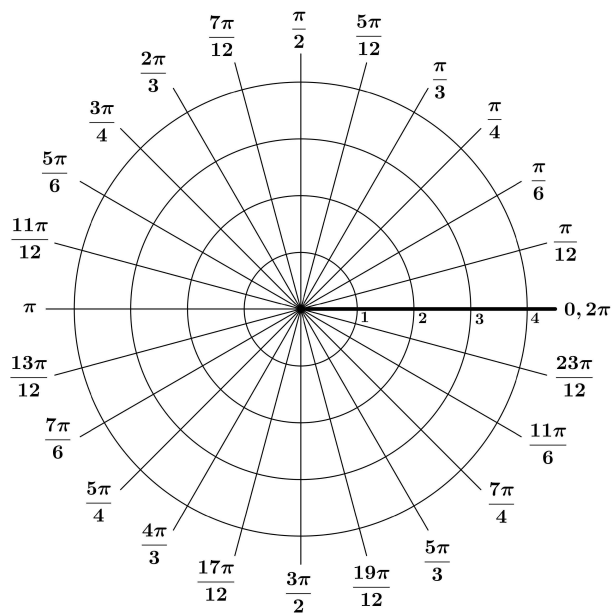
(3 pts.) (b) Compute $\frac{d^2y}{dx^2}$.

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

- 3) (5 pts.) (a) Sketch the following polar curve on the polar graph paper below:

$$r = 3 \cos(3\theta) \quad 0 \leq \theta \leq \pi$$

- (5 pts.) (b) Consider the polar curve from part (a). Find the slope of the tangent line to the curve at the point $\theta = \frac{\pi}{2}$.



4) Consider the polar curve $r = 2 \cos(\theta)$ for $0 \leq \theta \leq \pi$.

(5 pts.) (a) Find the values of θ where the tangent line is horizontal for $0 \leq \theta < \pi$.

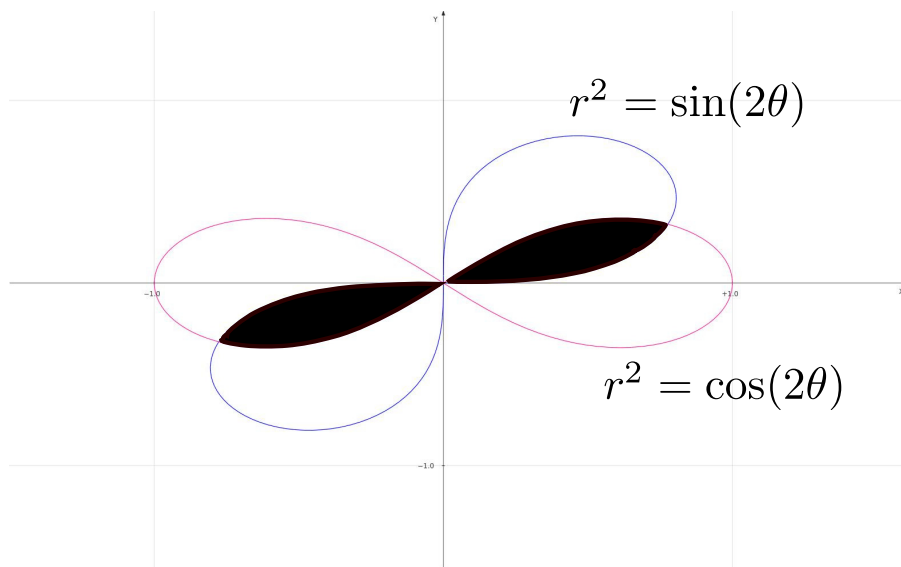
(5 pts.) (b) Find the values of θ where the tangent line is vertical for $0 \leq \theta < \pi$.

NOTE: You do not need to consider the $\frac{0}{0}$ case. If a value of θ gives $\frac{dy}{dx} = \frac{0}{0}$, state that the slope of the tangent line is indeterminate.

5) (10 pts.) Find the area of the region that lies between the petals (the region is shaded in the labeled plot below).

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

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



THIS PAGE IS LEFT BLANK FOR ANY SCRATCH WORK

END OF TEST