

MARK BOX		
PROBLEM	POINTS	
1	5	
2	5	
3	5	
TOTAL	15	

**NAME** (legibly printed): \_\_\_\_\_

**class PIN:** \_\_\_\_\_

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**INSTRUCTIONS:**

- (1) To receive credit you must:
    - (a) **work in a logical fashion, show all your work, indicate your reasoning; no credit will be given for an answer that *just appears*;**  
such explanations help with partial credit
    - (b) if a line/box is provided, then:
      - show your work BELOW the line/box
      - put your answer on/in the line/box
    - (c) if no such line/box is provided, then box your answer
  - (2) The MARK BOX indicates the problems along with their points.  
Check that your copy of the exam has all of the problems.
  - (3) This exam covers (from *Calculus* by Anton, Bivens, Davis 8<sup>th</sup> ed.): § 11.1, 11.2, 11.3 .
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**Problem Inspiration:** just like the homework.

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**Honor Code Statement**

I understand that it is the responsibility of every member of the Carolina community to uphold and maintain the University of South Carolina's Honor Code.

As a Carolinian, I certify that I have neither given nor received unauthorized aid on this exam.

Furthermore, I have not only read but will also follow the above Instructions.

I hereby verify that I did NOT receive help from other people on this take-home exam problem.

Signature : \_\_\_\_\_

1. Consider the point, in **polar coordinates**,

$$P = (r, \theta) = \left(4, \frac{2\pi}{3}\right).$$

In **cartesian coordinates**, the point  $P$  is given by

$$P = (x, y) = ( \text{_____} , \text{_____} ).$$

Below graph, and CLEARLY label, the following points.

$$P = \left(4, \frac{2\pi}{3}\right)$$

$$Q = \left(-4, \frac{2\pi}{3}\right)$$

$$R = \left(4, -\frac{2\pi}{3}\right)$$

$$S = \left(-4, -\frac{2\pi}{3}\right).$$

2. Consider the curve in polar coordinate

$$r^2 = 9 \sin(2\theta) .$$

2a. The period of  $r^2 = 9 \sin(2\theta)$  is \_\_\_\_\_.

2a.  $\frac{\text{the period of } r^2 = 9 \sin(2\theta)}{4} =$  \_\_\_\_\_

2c. Make a chart, as we did in class, to help you graph  $r^2 = 9 \sin(2\theta)$ .

2d. Graph  $r^2 = 9 \sin(2\theta)$ .

3. Express the area enclosed by  $r^2 = 9 \sin(2\theta)$  as an integral with respect to  $\theta$   
(ok ... with respect to  $\theta$  means a  $d\theta$  in there).  
(You do not have to evaluate this integral.)

area =