

MATHEMATICS DEPARTMENT
CALIFORNIA POLYTECHNIC STATE UNIVERSITY SAN LUIS OBISPO

Math 143

Exam 2

Fall 2019

Name: _____

Section Number: _____

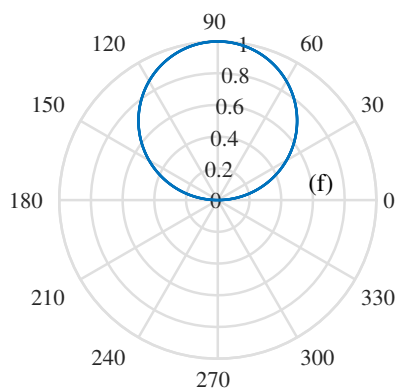
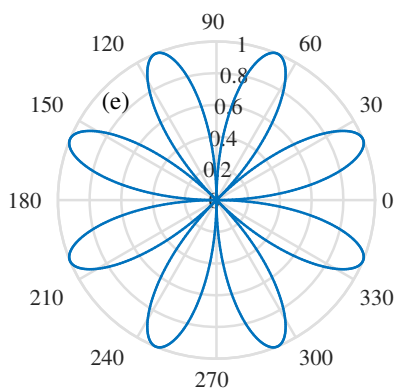
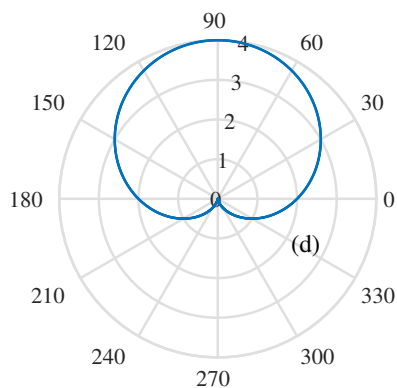
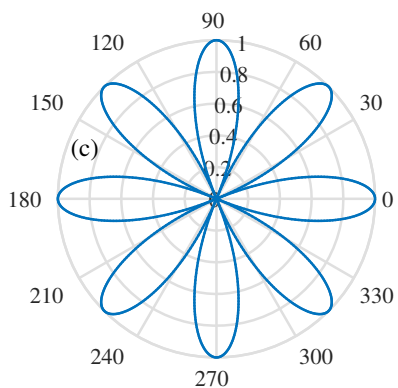
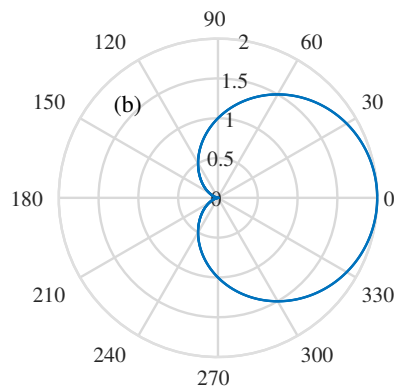
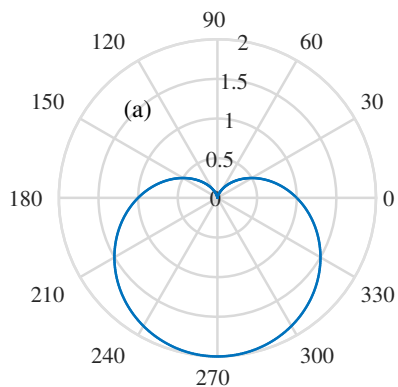
- You have 50 minutes to complete this exam.
- No notes, books, calculators, cell phones, or other references are allowed.
- In problems that require reasoning or algebraic calculation, it is not sufficient just to write the answers. You **must explain** how you arrived at your answers, and show your algebraic calculations.
- There are 7 pages, including this one, in this exam and 5 numbered problems. **Make sure you have them all before you begin!**
- Use page 7 if you need more space to write down your solutions.
- **You must show all work to receive credit.** Answers for which no work is shown will receive no credit (unless specifically stated otherwise).
- Let me wholeheartedly wish you good luck!!

1.	(16)	_____
2.	(24)	_____
3.	(20)	_____
4.	(20)	_____
5.	(20)	_____
Total		_____

Perfect Paper → 100 Points.

1. (16 points) Find the Taylor polynomial of order 2 generated by $f(x) = \ln(1+x)$ at $a = 0$.

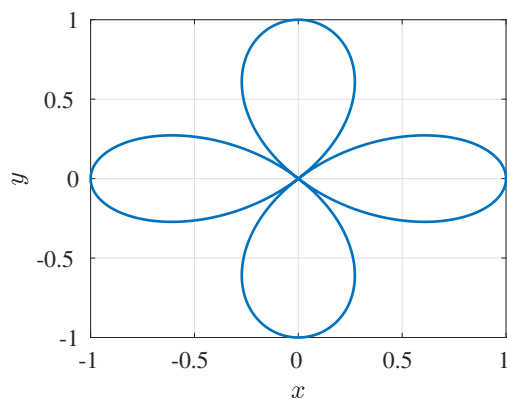
2. (24 points) Six polar graphs are given below and labeled as (a)-(f). Match each graph with its corresponding polar equation in the table below.



Polar equation	Graph
$r = 2 + 2 \sin \theta$	
$r = \sin \theta$	
$r = \sin 4\theta$	
$r = 1 - \sin \theta$	
$r = 1 + \cos \theta$	
$r = \cos 4\theta$	

3. (20 points) Consider the **four-leafed rose** shown in the figure below and given by

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



- (a) (5 points) Set up an integral which computes the area enclosed in **all loops**. Mathematically justify how you find the limits of integration.
- (b) (5 points) Set up an integral which computes the length of the curve. Similarly as in part (a), mathematically justify how you find the limits of integration.
- (c) (10 points) Find the slope of the tangent line for $r = \cos(2\theta)$ at $\theta = \pi/4$.

4. (20 points) Let $\vec{a} = \langle 2, 2, 1 \rangle$ and $\vec{b} = \langle 2, 4, 6 \rangle$.

(a) (5 points) Compute the $\vec{a} \cdot \vec{b}$.

(b) (5 points) Find the vector projection, call it \vec{c} , of \vec{b} onto \vec{a} .

(c) (5 points) Calculate the vector $\vec{b} - \vec{c}$, call it \vec{d} , and then show that this new vector is perpendicular to \vec{a} .

(d) (5 points) Find a unit vector in the direction of \vec{d} .

5. (20 points) Consider the vectors: $\vec{a} = \langle 3, -1, 1 \rangle$ and $\vec{b} = \langle 1, 1, 2 \rangle$.

(a) (15 points) Find $\vec{a} \times \vec{b}$ and its direction. Is the vector $\vec{a} \times \vec{b}$ parallel or perpendicular to both \vec{a} and \vec{b} ?

(b) (5 points) Find the sine of the angle θ between the vectors \vec{a} and \vec{b} .

