

MATH 244 Summer 2019
Exam 1

Name: _____

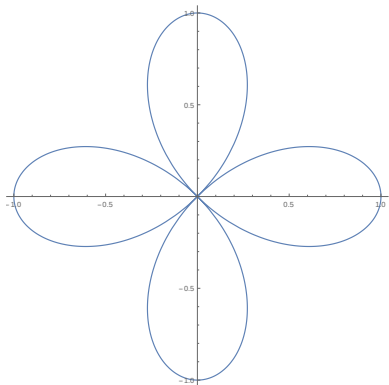
Instructions:

- You have 80 minutes to complete this exam.
- You may use a scientific calculator and a 3x5 notecard/cheat sheet during the exam.
- You must show all of your work. Answers which are cryptic or have no supporting evidence will most likely not receive full credit. When in doubt, ask.
- Please be organized! Answer questions in the space provided as neatly as possible. If you run out of room, continue on a piece of scratch paper and make a clear note of it.

| Question | Points | Score |
|----------|--------|-------|
| 1 | 7 | |
| 2 | 9 | |
| 3 | 11 | |
| 4 | 20 | |
| 5 | 9 | |
| 6 | 6 | |
| 7 | 6 | |
| Total: | 68 | |

1. (7 points) Evaluate the double integral $\iint_D 3x^2 + y \, dA$ where D is the region in the first quadrant bounded by the curves $y = x$ and $y = x^2$.

2. (9 points) Find the area of plane enclosed by the 4-leaf rose $r = \cos(2\theta)$. Below is the plot of the rose.



3. (11 points) Evaluate $\iiint_E x^2 + y^2 + z^2 dV$ where E is the solid between the upper hemisphere of $\rho = 2$ and the sphere $\rho = \cos \varphi$.

4. (20 points) Compute the centroid of the solid bounded below by the paraboloid $z = 1 - x^2 - y^2$ and above the xy -plane.

5. (9 points) Find the volume of the solid bounded by the cylinders $r = 1$ and $r = 2$, and by the cones $z = \pm r$.

6. (6 points) Let T be the tetrahedron in the 1st octant bounded by the plane $x + y + z = 1$. Suppose that the temperature at any point in the solid is proportional to the square of the distance to the origin. Write a formula in terms of triple integrals that gives the average temperature of E . You do not need to evaluate the integrals.

7. (6 points) Write an equivalent expression with the order of integration reversed of the integral

$$\int_{-1}^1 \int_{y-1}^{\sqrt{1-y^2}} \sin(x^2) dx dy.$$

You do not need to evaluate the integrals.