# Math 244 Exam 1, Spring 2023

**Name:**

| Question | Points | Score |
|:---:|:---:|:---:|
| 1 | 13 | |
| 2 | 5 | |
| 3 | 13 | |
| 4 | 11 | |
| 5 | 0 | |
| Total: | 42 | |

- You have 50 minutes to complete this exam.

- Please ask if anything seems confusing or ambiguous.

- You must show all your work unless the problem states otherwise. You will get almost no credit for solutions that are not fully justified.

- You may use a 3x5 notecard with notes.

- No electronic devices are authorized with the exception of a scientific calculator.

- You do not need to simplify your answers.

- The back side of each page can be used as scratch paper.

- Good luck!

| | |
|---|---|
| Homework | |
| Exam 1 | |
| Total | |

1. (13 points) Set up the three double integrals necessary to find the centroid of the thin lamina bounded by the lines $y = \pm x$ and the circle $x^2 + (y-1)^2 = 1$. Set up the integrals in polar coordinates, you do not need to solve them.
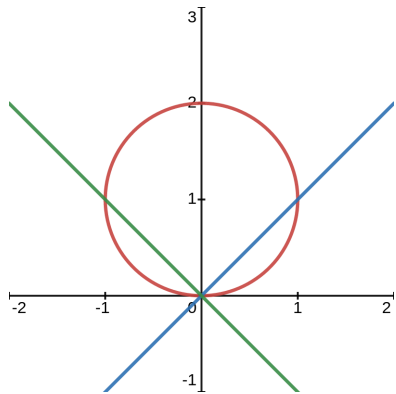
2. (5 points) Let $D$ be the region enclosed by the curves $x = 1$, $y = -1$, $x = y^3 - y$ and $y = (x - 1)^2$. See the picture below.
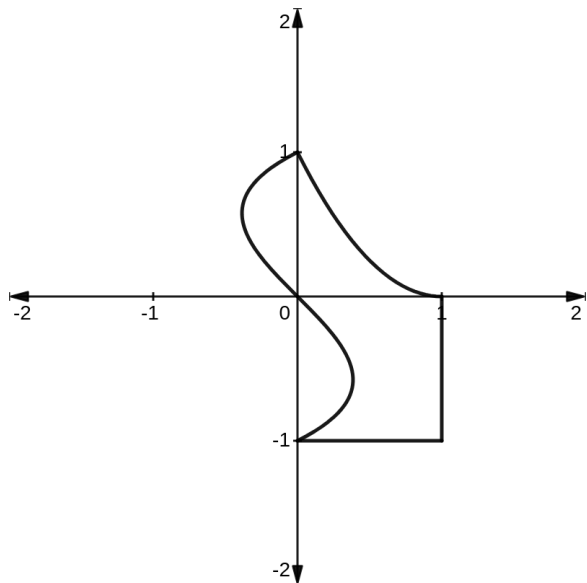


Write the double integral $\iint_D f(x, y)\, dA$ as a sum of type I and/or type II integrals.

3. (13 points) Find the polar moment of inertia $I_0$ of the homogeneous square lamina bounded by the lines $y = \pm a$ and $x = \pm a$.

4. (11 points) Use a double integral to find the surface area of the portion of the cone $z = \sqrt{x^2 + y^2}$ over the disk $x^2 + y^2 \leq 4$.

5. (5 points (bonus)) Give an example of a lamina whose center of mass does not lie within the lamina.