

# Math 243 Midterm 2

October 25, 2019

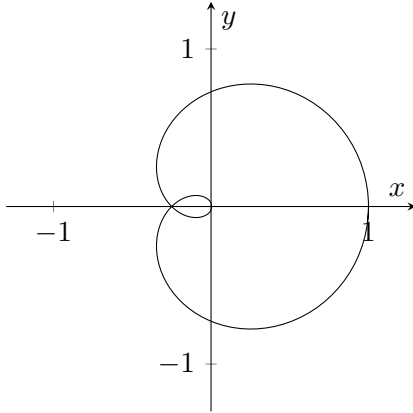
Name: \_\_\_\_\_ ID: \_\_\_\_\_

- Each page has a space at the top for the last 4 digits of your student ID. Make sure that you fill that out on at least one side of every sheet of paper.
- Show enough work that your solution would convince your peers that your answer is correct.
- The questions are ordered by topic, not by difficulty.
- Each question is worth the same number of points.
- You may not use any tools or resources other than writing implements. In particular, no calculators, phones, notes, and so forth.

1. Set up an integral for the length of the curve represented by the polar equation

$$r = \cos^4(\theta/4).$$

You do not need to evaluate the integral.

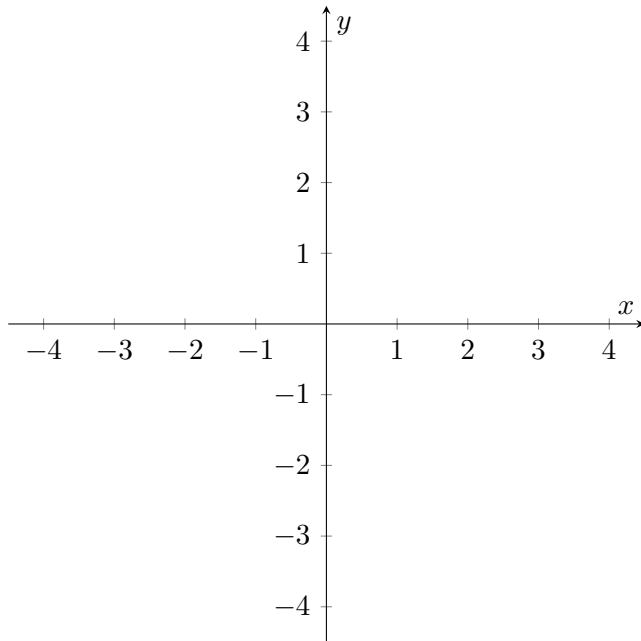


2. Find the vertex, focus, and directrix of the parabola

$$(y - 2)^2 = 2x + 1.$$

Sketch the parabola, focus, and directrix.

The textbook contains the formula  $x^2 = 4py$ .



3. Find the vertices and foci of the curve described by the equation

$$\frac{x^2}{2} + \frac{y^2}{4} = 1.$$

Sketch the curve, label the vertices, and draw and label the foci.

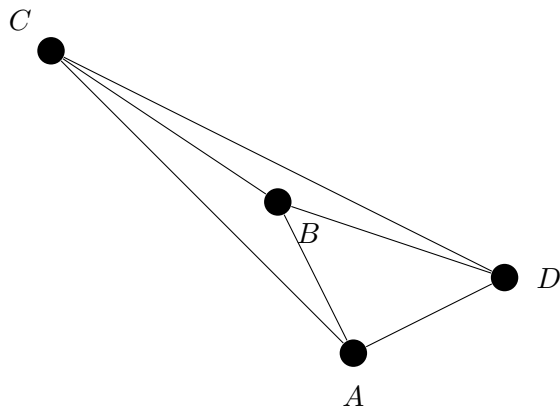
4. Find the equation of the sphere with center  $(2, -3, 6)$  that touches the  $xy$ -plane.

5. Describe in words the region of three-dimensional space represented by the equation

$$x^2 + y^2 + z^2 \leq 4.$$

Be specific.

6. Consider four points below:



Write each combination of vectors as a single vector.

(a)  $\overrightarrow{AB} + \overrightarrow{BC}$ .

(b)  $\overrightarrow{CD} + \overrightarrow{DB}$ .

(c)  $\overrightarrow{DB} - \overrightarrow{AB}$ .

(d)  $\overrightarrow{DC} + \overrightarrow{CA} + \overrightarrow{AB}$ .

7. Find the work done by a force  $\mathbf{F} = 8\mathbf{i} - 6\mathbf{j} + 9\mathbf{k}$  acting on an object that moves from the point  $(0, 10, 8)$  to the point  $(6, 12, 18)$  along a straight line. The distance is measured in meters and the force is measured in newtons.