

MATH 1272
Professor Bramson, 12:20
Midterm II
March 26, 2013

Name: _____

T.A.: _____

INSTRUCTIONS: There are 100 points possible on the exam. Do as many problems as you can. Answers must be in the boxes provided to be counted. Show your work in the space provided below each problem - outside the boxes. If you need extra space, state where the work is being done. Also, be sure to justify your answers. Page 7 is provided as scratch; some formulas are given on page 8. Be sure your exam has all 8 pages. **NO CALCULATORS** are permitted. **GOOD LUCK!**

1. (15 pts) What are the equilibrium solutions for the differential equation

$$yy' = (y^2 + 5y + 4) \cos y?$$

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2. (20 pts) (a) Find the general solution of $(x^2 + 4x + 5)y' = y + 1$. (Write the answer as a function of x .) Show your work.

(b) What is the solution with $y(-2) = 3$?

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3. (15 pts) What is the centroid of the region lying above $f(x) = x^3 + x^2 + 3$ and below $g(x) = x^3 + 3x + 1$? You can write your answer in terms of integrals. (Do not simplify. In particular, do not bother to multiply out the polynomials.) Write down any formulas you are using.

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4. (15 pts) In each of the following two problems, state whether the graph of the following equations is:

- (A) A circle centered at the origin.
- (B) A circle that is not centered at the origin.
- (C) A cardioid.
- (D) A three-leaved rose.
- (E) A four-leaved rose.
- (F) A six-leaved rose.
- (G) A line.

No justification is necessary.

(I.) $r = 3 \sin \theta$.

(II.) $r = \cos 3\theta$. (Hint: be careful.)

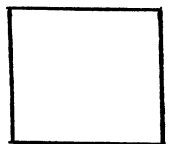
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5. (15 pts) Which of the following is true for

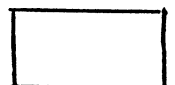
$$\int_2^{\infty} \frac{x + 3x^2 - x^2 \log x - \sin x}{x + 3x^2 + x^3 e^{-x}} dx$$

- (A) The limit exists and it is finite.
- (B) The limit exists and it is ∞ .
- (C) The limit exists and it is $-\infty$.
- (D) The limit does not exist.

Explain your answer *carefully*, stating all results that you are using.



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6. (20 pts) Find all points of intersection of the curves defined by $r = 2 \sin 2\theta$ and $r = 1$. (Give both the r and θ coordinates.) Explain your reasoning clearly.

