

Name: _____

TA: Michael Childers Marc Conrad
 Patrick Curran Matija kazalicki
 Jeremy Rouse

Section number: _____

| | | |
|-------|------------|--|
| I | 15 Points | |
| II | 20 Points | |
| III | 15 Points | |
| IV | 15 Points | |
| V | 20 Points | |
| VI | 15 Points | |
| Total | 100 Points | |

1. Write your name and section number on every answer sheet.
2. Show your reasoning. You need to show work to get full credit.
3. Leave your answers in form of $\sqrt{2} + \pi^3$, $\ln(2)$, etc. No Calculators are allowed.
4. Circle your final answers.

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I. (15 points.) Find the indefinite integral

$$\int 2x \ln(x^2) dx.$$

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II. (20 points.)

(A) Compute the definite integral

$$\int_0^3 \frac{2}{3} \sqrt{9-x^2} dx$$

(B) Find the area of the ellipse with equation $\frac{x^2}{9} + \frac{y^2}{4} = 1$. (Hint: What is the equation of the given ellipse in the first quadrant in the form $y = \dots$?)

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III. (15 points.) Compute the improper integral

$$\int_{-\infty}^{\infty} \frac{2x}{x^2 + 1} dx.$$

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IV. (15 points.) Compute the indefinite integral

$$\int \frac{x^2 + x + 1}{x(x^2 + 1)} dx.$$

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V. (20 points.) Let $x^2 + xy + y^2 = 1$ be given.

(A) Determine the angle of rotation θ needed to eliminate the cross product in the given equation.

(B) Identify the conic and find its eccentricity.

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VI. (15 points.) In each part find the area of the shaded area. Set up the integrals but do NOT evaluate them.

