

MATH 242, Fall 2006
Exam 2: November 1, 10:10-11:00

Only the blue book will be graded. On the front cover, please write **Form B** clearly, along with your name and section number. Please start each problem on a new page, circle final answers, and cross out incorrect work. **Unless otherwise noted, you must justify all answers to receive full credit.** You may not use calculators, notes, or any other kinds of aids.

- (10 points) Which of the following equations corresponds to the graph at the right? **Explain your answer to receive credit.**
 - $y^2 + 4y - 4x^2 = 0$
 - $y^2 + 4y - 4x = 0$
 - $y^2 - 4y - 4x^2 = 0$
 - $y^2 + 4y + 4x^2 = 0$
- (10 points) Convert the polar curve $r \cos \theta = r^2 + 2r \sin \theta$ to rectangular coordinates.
- (10 points) Find the area inside one loop of the polar curve $r = \sin 3\theta$, from $\theta = 0$ to $\theta = \pi/3$.
- Consider the curve defined by $x = 2 \cos t$, $y = -1 + \sin t$, for $0 \leq t \leq 3\pi/2$.
 - (10 points) At what point(s) (x and y values) does the curve have a vertical tangent?
 - (10 points) Eliminate the parameter and sketch the curve.
- (15 points each) Evaluate each integral. (You don't have to combine numerical fractions in the answer.)

$$(a) \int x e^{2x} dx$$

$$(b) \int_{\sqrt{3}/2}^1 15x^3 \sqrt{1-x^2} dx$$

- (10 points each) Evaluate each integral, or show that it is divergent.

$$(a) \int_1^3 \frac{1}{\sqrt{x-1}} dx$$

$$(b) \int_1^\infty \frac{\ln x}{x} dx$$

$$\frac{d}{dx} (\sin^{-1} x) = \frac{1}{\sqrt{1-x^2}}$$

$$\frac{d}{dx} (\tan^{-1} x) = \frac{1}{1+x^2}$$

$$1 - \sin^2 \theta = \cos^2 \theta$$

$$1 + \tan^2 \theta = \sec^2 \theta$$

$$\sin^2 \theta = \frac{1}{2}(1 - \cos 2\theta)$$

$$\cos^2 \theta = \frac{1}{2}(1 + \cos 2\theta)$$