Math 15, Exam 4, Apr 28, 2005

Instructions

Calculators may be used on this exam.

<u>However, you must show your work in order to receive credit.</u>

1. Be sure to print your name and your instructor's name in the space provided.
2. Work all problems. Show all work. Full credit will be given only if work is shown which fully justifies your answer.
3. There will be sufficient space under each problem in which to show your work.
4. Circle, box, or underline each final answer. *All final answers must be simplified!*
5. This exam has 4 sheets of paper (front and back). Do not remove the staple! There are 100 points. Each problem is 10 points.
6. Turn off your cell phone if you have one with you.

Get ready for the exam

1. Some formulas will be supplied (see below). You are asked to remember other formulas and techniques from Chapters 7-12 and Math 14.
2. Problems will be (directly or slightly modified) from homework problems assigned from Chapters 9-11.
3. You should be able to do all of the following:
   a. Find the length of an arc.
   b. Find the area of a surface of revolution (around one of the coordinate axes).
   c. Calculate force due to liquid pressure and find the centroid of a planar figure.
   d. Check whether certain functions are solutions of given differential equations.
   e. Solve problems of exponential growth or decay such as bacteria growth, radioactive decay, Newton's law of cooling, and continuously compounded interest.
   f. Sketch curves given in parametric form and find tangent lines to such curves.
   g. Find arc length and surface area of revolution using equations in parametric form.
   h. Sketch graphs from equations given in polar form.
   i. Convert from polar coordinates to Cartesian coordinates and vice versa.

$$M_y = \rho \int_a^b x[f(x) - g(x)]dx \qquad M_x = \rho \int_a^b \frac{1}{2}\left[(f(x))^2 - (g(x))^2\right] dx$$

$$\bar{x} = \frac{M_y}{m} \qquad \bar{y} = \frac{M_x}{m} \qquad m = \rho A$$

$$ds = \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx \qquad ds = \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dy \qquad ds = \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt$$

$$L = \int ds, \qquad L = \int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx \qquad L = \int_c^d \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dy$$

$$L = \int_\alpha^\beta \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2} dt \qquad L = \int_a^b \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2} d\theta$$

$$S = \int 2\pi y ds \qquad S = \int 2\pi x ds \qquad A = \int_a^b \frac{1}{2}\left\{[f(\theta)]^2 - [g(\theta)]^2\right\} d\theta$$