

Advanced Placement Calculus

Name _____

Copy original problem.

Per _____

Date _____

Convince *me* that **you** understand the concept!

Chapter 10 Exam

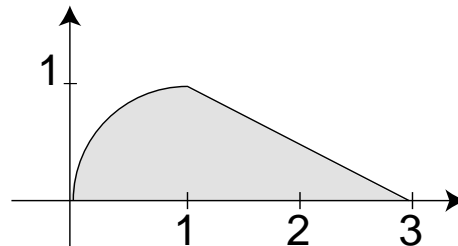
I

R is the region shown shaded. The curves involved are:

$$y = 0, \quad 2y = -x + 3, \quad \text{and} \quad (x-1)^2 + y^2 = 1.$$

For each problem in this section, reproduce the picture at the right and indicate any significant items for that specific problem (such as the typical cross section).

Integrals are to be fully simplified but do not actually evaluate any of the integrals in this section.



- Set up the explicit integral for the area of R using horizontal cross sections. (10 pts)
- Set up the explicit which describes the surface area of the solid obtained when R is rotated about the x -axis. (10 pts)
- Set up the explicit integral for the volume of the solid obtained by rotating R about the line $y = -1$. Use the “shell” method. (15 pts)
- Set up the explicit integral for the volume of the solid obtained by rotating R about the line $y = -1$. Do **NOT** use the “shell” method. (15 pts)
- Let $c(x)$ be the vertical cross section of R . Set up the explicit integral for the average value of $c(x)$. (10 pts)

II

Given the two polar equations: $r = 4$ and $r = 3\cos 2\theta$ (25 pts tot)

- Sketch both equations on the same polar axis.
- Set up but do not actually evaluate the explicit integral for the arc length of one leaf of $r = 3\cos 2\theta$.
- Find the area of the region inside the circle but outside of the clover leaf without using a calculator.
- Find the area of the region inside the circle but outside of the clover leaf using a calculator.
- Reconcile the differences in your answers to parts c and d above.

III

Given: $x(u) = \tan u$ and $y(u) = \sec u$. (15 pts)

Find $\frac{dy}{dx}$ as functions of u . (fully simplified, of course.)

Extra Credit ----- **5 pts** -----

Reconcider section III above. Find $\frac{d^2y}{dx^2}$ as functions of u . (fully simplified, of course.)