

Mathematics 1101Y – Calculus I: Functions and calculus of one variable

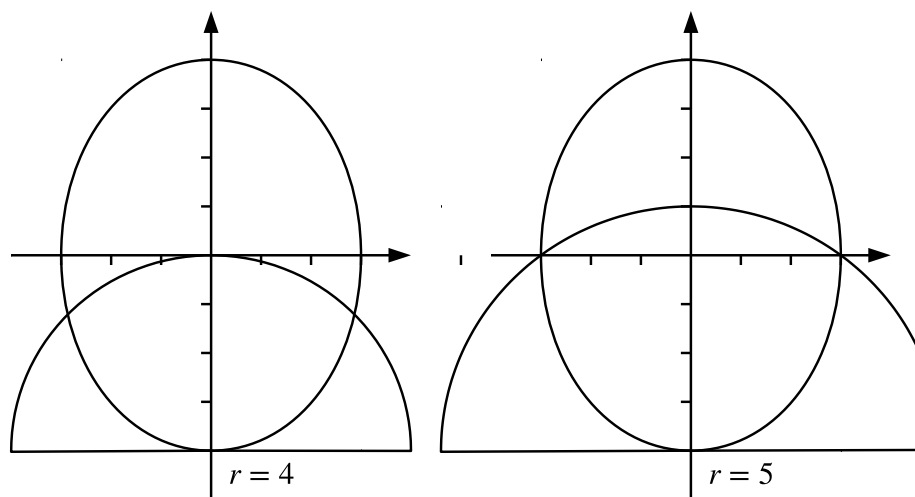
TRENT UNIVERSITY, 2013–2014

Assignment #4

Intersection

Due on Monday, 27 January, 2014.

Suppose $r > 0$ is a real number. The circle $x^2 + (y + r)^2 = r^2$ has radius r , centre $(0, -r)$, and its top just touches the origin $(0, 0)$. We will consider a problem involving the intersections of such circles with the ellipse the ellipse $\frac{x^2}{9} + \frac{y^2}{16} = 1$, as in the diagram below.



1. Compute the value of r such that the area of the intersection of the ellipse $\frac{x^2}{9} + \frac{y^2}{16} = 1$ and the circle $x^2 + (y + r)^2 = r^2$ is exactly half of the area of the ellipse. [10]

Hints: The area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is πab . It should be obvious from the diagram above that the necessary value of r is between 4 and 5. While this problem can be solved by hand, it will be much faster to get Maple to do much of the grunt work ... (In particular, the `int` operation may be helpful.)