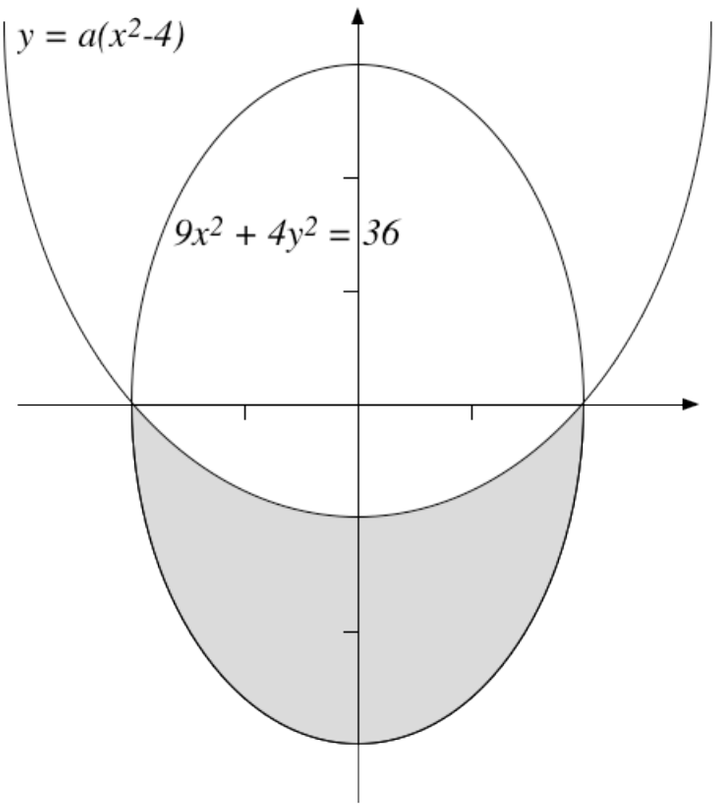
Mathematics 1100Y – Calculus I: Calculus of one variable
TRENT UNIVERSITY, SUMMER 2011

Assignment #8
Smile!?
Due on Monday, 27 June, 2011.

The ellipse with equation $9x^2 + 4y^2 = 36$ (in standard form $\frac{x^2}{4} + \frac{y^2}{9} = 1$) has its x-intercepts at $x = \pm 2$. The parabola $y = a\left(x^2 - 4\right) = ax^2 - 4a$, where we require that $a > 0$, also has its x-intercepts at $x = \pm 2$.



1. Find the value of a so that the area of the part of the ellipse $9x^2 + 4y^2 = 36$ below the parabola $y = a\left(x^2 - 4\right)$ is exactly 2π. *[10]*

HINT: This is doable by hand – though you may have to read ahead to learn about trigonometric substitutions to do the relevant integral – but it would be a lot less work to use `Maple`...

NOTE: Not that you need to know it for this problem, but the area enclosed by the ellipse with equation $\frac{x^2}{c^2} + \frac{y^2}{d^2} = 1$ is πcd. In this case $c = 2$ and $d = 3$, which makes the area of the whole ellipse 6π, so the question asks you to find the value of a which makes the area of the region $\frac{1}{3}$ the area of the whole ellipse.