9 A particle moves along a path given by the parametric equations

$$x = 4\cos t - \sin t$$

$$y = 4\sin t - \cos t$$

for $0 \leq t \leq 2\pi$

9 (a) (i) Show that

$$x^2 + y^2 = p - q\sin 2t$$

where p and q are integers to be found.

[5 marks]

9 (a) (ii) Hence deduce the maximum distance of the particle from the origin.

[2 marks]

9 (b) Show that a Cartesian equation of the path is given by

$$(x + 4y)^2 + (4x + y)^2 = a$$

where a is an integer to be found.

[3 marks]