Ellipses Overview (26/5/21)

Q1 [Practice/E]

Show that the equation of the tangent to the ellipse

$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at the point (x_1, y_1) is $\frac{yy_1}{b^2} + \frac{xx_1}{a^2} = 1$

Q2 [11 marks]

Given the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and circle $x^2 + y^2 = a^2$, let l_1 be the tangent to the ellipse at the point $(a\cos\theta, b\sin\theta)$ and l_2 be the tangent to the circle at the point $(a\cos\theta, a\sin\theta)$. Find the locus of the point of intersection of l_1 & l_2, as θ varies.

Q3 [6 marks]

Show that the area within the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ is πab