**3D Gradients of an Ellipse**

1. Find the equation of the tangent to the ellipse with equation $\frac{x^{2}}{9}+\frac{y^{2}}{4}=1$ at the point $\left(3\cos(θ),2\sin(θ)\right)$
2. Show that the equation of the normal to the ellipse with equation $\frac{x^{2}}{a^{2}}+\frac{y^{2}}{b^{2}}=1$ at the point $P\left(a\cos(θ),b\sin(θ)\right)$ is $by\cos(θ)=ax\sin(θ)+\left(b^{2}-a^{2}\right)\cos(θ)\sin(θ)$

Notes on tangents and normals to an ellipse

1. The point $P\left(2,\frac{3\sqrt{3}}{2}\right)$ lies on the ellipse $E$ with parametric equations
$x=4\cos(θ), y=3 sin θ$.
2. Find the value of $θ$ at the point $P$.
3. Find the equation of the normal to the ellipse at point $P$.
4. Show that the condition for $y=mx+c$ to be a tangent to the ellipse $\frac{x^{2}}{a^{2}}+\frac{y^{2}}{b^{2}}=1$ is

$$a^{2}m^{2}+b^{2}=c^{2}$$

1. The ellipse $C$ has the equation $\frac{x^{2}}{5^{2}}-\frac{y^{2}}{3^{2}}=1$. The line $l$ is normal to the ellipse at the point $P$ and passes through the point $Q$, where $C$ cuts the $y$-axis, as shown in the diagram.

Find the exact coordinates of the point $R$, where $l$ cuts the positive$ x$-axis.

