Summary of key points

1 For a point P with polar coordinates (r, θ) and Cartesian coordinates (x, y),

   - $r\cos\theta = x$ and $r\sin\theta = y$
   - $r^2 = x^2 + y^2$, $\theta = \arctan\left(\dfrac{y}{x}\right)$

   Care must be taken to ensure that θ is in the correct quadrant.

2 - $r = a$ is a circle with centre O and radius a.
   - $\theta = \alpha$ is a half-line through O and making an angle α with the initial line.
   - $r = a\theta$ is a spiral starting at O.

3 The **area of a sector** bounded by a polar curve and the half-lines $\theta = \alpha$ and $\theta = \beta$, where θ is in radians, is given by the formula

   $$\textbf{Area} = \tfrac{1}{2}\int_{\alpha}^{\beta} r^2 \, \textbf{d}\theta$$

4 - To find a tangent parallel to the initial line set $\dfrac{\mathrm{d}y}{\mathrm{d}\theta} = 0$.

   - To find a tangent perpendicular to the initial line set $\dfrac{\mathrm{d}x}{\mathrm{d}\theta} = 0$.