AQA – Polar coordinates – A2 Further Mathematics P1
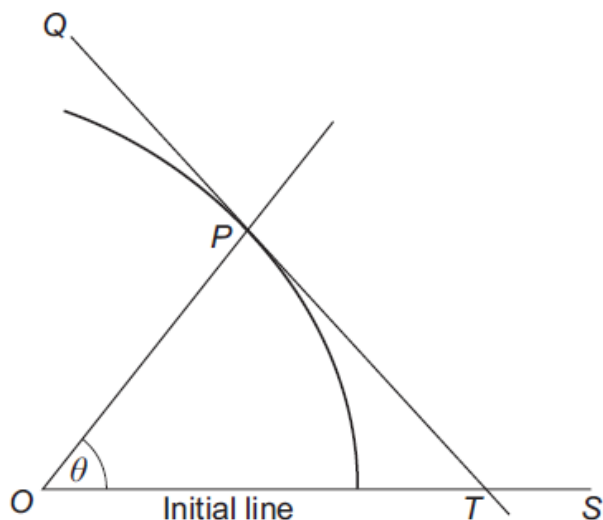
1. June/2020/Paper_1/No.15

The diagram shows part of a spiral curve.

The point P has polar coordinates (r, θ) where $0 \leq \theta \leq \dfrac{\pi}{2}$

The points T and S lie on the initial line and O is the pole.

TPQ is the tangent to the curve at P.

(a)   Show that the gradient of TPQ is equal to

$$\frac{\dfrac{\mathrm{d}r}{\mathrm{d}\theta}\sin\theta + r\cos\theta}{\dfrac{\mathrm{d}r}{\mathrm{d}\theta}\cos\theta - r\sin\theta}$$

[4 marks]

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(b) The curve has polar equation

$$r = e^{(\cot b)\theta}$$

where b is a constant such that $0 < b < \dfrac{\pi}{2}$

Use the result of part **(a)** to show that the angle between the line *OP* and the tangent *TPQ* does not depend on θ.

[7 marks]

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