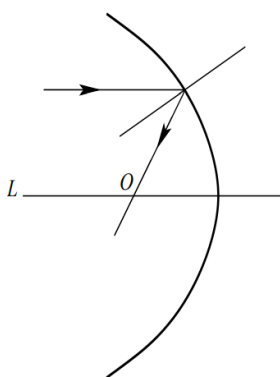


STEP III, 2006, Q6

- 6 Show that in polar coordinates the gradient of any curve at the point (r, θ) is

$$\frac{\frac{dr}{d\theta} \tan \theta + r}{\frac{dr}{d\theta} - r \tan \theta}.$$

A mirror is designed so that if an incident ray of light is parallel to a fixed line L the reflected ray passes through a fixed point O on L . Prove that the mirror intersects any plane containing L in a parabola. You should assume that the angle between the incident ray and the normal is the same as the angle between the reflected ray and the normal.



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