9 A water slide is the shape of a curve PQ as shown in **Figure 1** below.

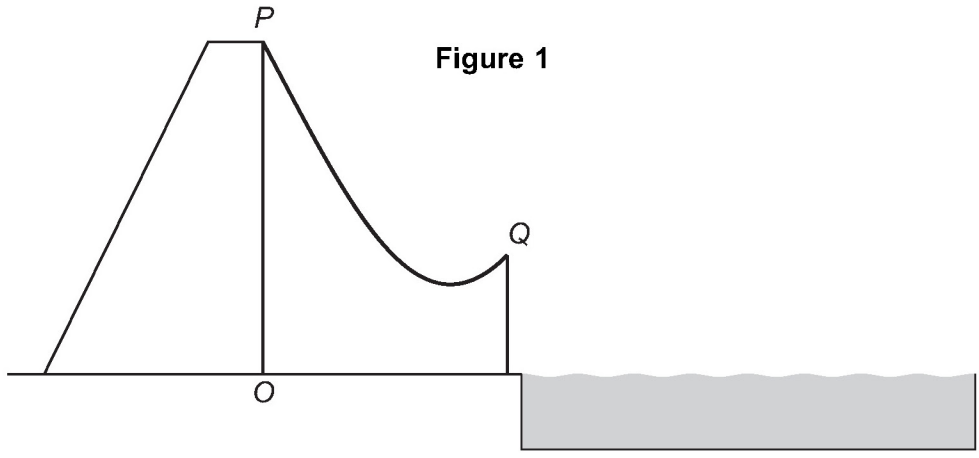

Figure 1

The curve can be modelled by the parametric equations

$$x = t - \frac{1}{t} + 4.8$$

$$y = t + \frac{2}{t}$$

where $0.2 \leq t \leq 3$

The horizontal distance from O is x metres.

The vertical distance above the point O at ground level is y metres.

P is the point where $t = 0.2$ and Q is the point where $t = 3$

9 (a) To make sure speeds are safe at Q, the difference in height between P and Q must be less than 7 metres.

Show that the slide meets this safety requirement.

[3 marks]

9 (b) (i) Find an expression for $\frac{dy}{dx}$ in terms of t

[3 marks]

9 (b) (ii) A vertical support, RS, is to be added between the ground and the lowest point on the slide as shown in **Figure 2** below.

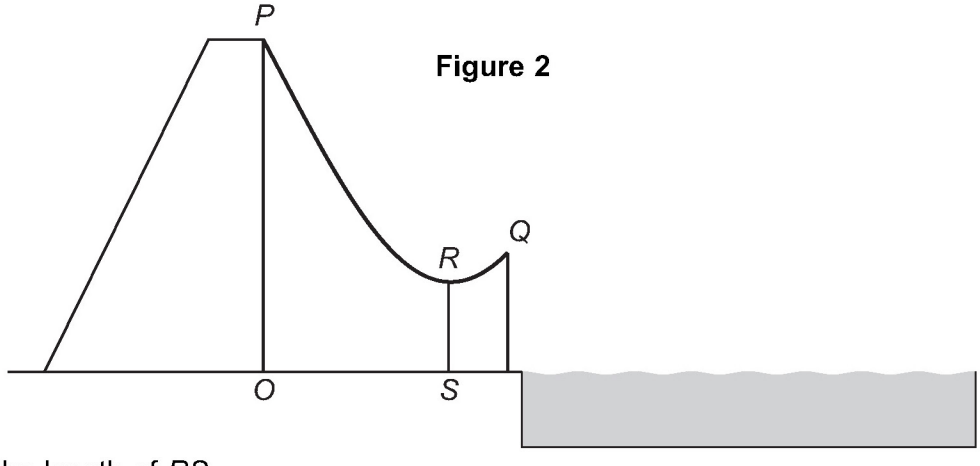

Figure 2

Find the length of RS

[4 marks]

9 (b) (iii) Find the acute angle the slide makes with the horizontal at Q

Give your answer to the nearest degree.

[2 marks]