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3. (a) Given that $y = \text{arsech}\left(\frac{x}{2}\right)$, where $0 < x \leqslant 2$, show that

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{p}{x\sqrt{q - x^2}}$$

where p and q are constants to be determined.

(4)

In part (b) solutions based entirely on calculator technology are not acceptable.

$$\mathrm{f}(x) = \text{artanh}(x) + \text{arsech}\left(\frac{x}{2}\right) \qquad 0 < x \leqslant 1$$

(b) Determine, in simplest form, the exact value of x for which $\mathrm{f}'(x) = 0$

(5)

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Question 3 continued

Q3

(Total 9 marks)