6. **In this question you must show all stages of your working.**

Solutions relying entirely on calculator technology are not acceptable.

The rectangular hyperbola H has equation $xy = 20$

The point $P\left(2t\sqrt{a}, \frac{2\sqrt{a}}{t}\right)$, $t \neq 0$, where a is a constant, is a general point on H

(a) State the value of a

(1)

(b) Show that the normal to H at the point P has equation

$$ty - t^3x - 2\sqrt{5}\left(1 - t^4\right) = 0$$

(4)

The points A and B lie on H

The point A has parameter $t = c$ and the point B has parameter $t = -\frac{1}{2c}$, where c is a constant.

The normal to H at A meets H again at B

(c) Determine the possible values of c

(4)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 9 marks)