2. **In this question you must show all stages of your working.**
Solutions relying entirely on calculator technology are not acceptable.

(a) Use integration to show that

$$\int \frac{1}{1-x^2}\,\mathrm{d}x = \operatorname{artanh} x + c \qquad |x| < 1$$

where c is an arbitrary constant.

(3)

The curve with equation

$$y = \operatorname{artanh} 2x - 8\arctan 4x \qquad 0 < x < \frac{1}{2}$$

has a stationary point P.

(b) Determine

(i) the exact x coordinate of P

(ii) the exact y coordinate of P, giving the answer in the form

$$\frac{1}{2}\ln\left(p + q\sqrt{3}\right) + \frac{r\pi}{3}$$

where p, q and r are integers.

(5)

(Total for Question 2 is 8 marks)