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

Given that when $y = \arcsin 2x$

$$\frac{\mathrm{d}y}{\mathrm{d}x} = 2\left(1 - 4x^2\right)^{-\frac{1}{2}}$$

(a) show that

$$\frac{\mathrm{d}^3y}{\mathrm{d}x^3} = \frac{Ax^2 + 8}{\left(1 - 4x^2\right)^{\frac{5}{2}}}$$

where A is a constant to be determined.

(3)

(b) Hence determine the Maclaurin series expansion for $\arcsin 2x$ in ascending powers of x up to and including the term in x^3

(2)

The Maclaurin series expansion for e^x is given by

$$\mathrm{e}^x = 1 + x + \frac{x^2}{2} + \ldots + \frac{x^r}{r!} + \ldots$$

(c) Use the Maclaurin series expansion for e^{3x} and the answer to part (b) to show that, for small values of x

$$\mathrm{e}^{3x}\arcsin 2x \approx Cx + Dx^2 + Ex^3$$

where C, D and E are constants to be determined.

(3)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 3 continued

Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 3 continued

(Total for Question 3 is 8 marks)