1.

$$f(x) = \frac{50x^2 + 38x + 9}{(5x + 2)^2(1 - 2x)} \qquad x \neq -\frac{2}{5} \quad x \neq \frac{1}{2}$$

Given that f(x) can be expressed in the form

$$\frac{A}{5x+2} + \frac{B}{(5x+2)^2} + \frac{C}{1-2x}$$

where A, B and C are constants

- (a) (i) find the value of B and the value of C
  - (ii) show that A = 0

**(4)** 

(b) (i) Use binomial expansions to show that, in ascending powers of x

$$f(x) = p + qx + rx^2 + \dots$$

where p, q and r are simplified fractions to be found.

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(7)

2.	(a) Find the first four terms, in ascending powers of $x$ , of the binomial expansion of					
	$\sqrt{4-9x}$					
	writing each term in simplest form.					
	A student uses this expansion with $x = \frac{1}{9}$ to find an approximation for $\sqrt{3}$	(4)				
	Using the answer to part (a) and without doing any calculations,					
	(b) state whether this approximation will be an overestimate or an underestimate of $\sqrt{3}$ giving a brief reason for your answer.					
		(1)				

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

3. (a) Find the first three terms, in ascending powers of x, of the binomial expansion of

$$(3 + x)^{-2}$$

writing each term in simplest form.

**(4)** 

(b) Using the answer to part (a) and using algebraic integration, estimate the value of

$$\int_{0.2}^{0.4} \frac{6x}{(3+x)^2} \, \mathrm{d}x$$

giving your answer to 4 significant figures.

**(4)** 

(c) Find, using algebraic integration, the exact value of

$$\int_{0.2}^{0.4} \frac{6x}{(3+x)^2} \, \mathrm{d}x$$

giving your answer in the form  $a \ln b + c$ , where a, b and c are constants to be found.

**(5)**