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

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

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

   where p, q and r are simplified fractions to be found.
   (ii) Find the range of values of x for which this expansion is valid.

(7)

(Total for question = 11 marks)

2. $f(x) = \frac{5x+3}{(1-x)(1+3x)}, \quad |x| < \frac{1}{3},$

   (a) Express $f(x)$ into partial fractions
   (b) Hence find the series expansion of $f(x)$, up to and including the term in x^3

   Answers

1.a)i) B=1, C=2

b)i) $p = \frac{9}{4}, q = \frac{11}{4}, r = \frac{203}{16}$ ii) $|x| < \frac{2}{5}$

2. (a) $f(x) = \frac{2}{1-x} + \frac{1}{1+3x}$ (b) $f(x) = 3 - x + 11x^2 - 25x^3$