

9 (a) (i) Find the binomial expansion of $(1 + 3x)^{-1}$ up to and including the term in x^2 [2 marks]

9 (a) (ii) Show that the first three terms in the binomial expansion of

$$\frac{1}{2 - 3x}$$

form a geometric sequence and state the common ratio.

[5 marks]

9 (b) It is given that

$$\frac{36x}{(1 + 3x)(2 - 3x)} \equiv \frac{P}{(2 - 3x)} + \frac{Q}{(1 + 3x)}$$

where P and Q are integers.

Find the value of P and the value of Q

[3 marks]

9 (c) (i) Using your answers to parts (a) and (b), find the binomial expansion of

$$\frac{12x}{(1 + 3x)(2 - 3x)}$$

up to and including the term in x^2

[2 marks]

9 (c) (ii) Find the range of values of x for which the binomial expansion of

$$\frac{12x}{(1 + 3x)(2 - 3x)}$$

is valid.

[1 mark]