



## General Binomial Expansion Exam Questions Sheet 2

**Q1.**

Given

$$f(x) = (2 + 3x)^{-3}, \quad |x|$$

find the binomial expansion of  $f(x)$ , in ascending powers of  $x$ , up to and including the term in  $x^3$ .

Give each coefficient as a simplified fraction.

(5)

(Total 5 marks)

**Q2.**

Given that the binomial expansion of  $(1 + kx)^{-4}$ ,  $|kx| < 1$ , is

$$1 - 6x + Ax^2 + \dots$$

(a) find the value of the constant  $k$ ,

(2)

(b) find the value of the constant  $A$ , giving your answer in its simplest form.

(3)

(Total 5 marks)

**Q3.**

$$f(x) = \frac{1}{\sqrt{(9 + 4x^2)}}, \quad |x| < \frac{3}{2}$$

Find the first three non-zero terms of the binomial expansion of  $f(x)$  in ascending powers of  $x$ . Give each coefficient as a simplified fraction.

(6)

(Total 6 marks)



**Q4.**

(a) Expand

$$\frac{1}{(2-5x)^2}, \quad |x| < \frac{2}{5}$$

in ascending powers of  $x$ , up to and including the term in  $x^2$ , giving each term as a simplified fraction.

(5)

Given that the binomial expansion of

$$\frac{2+kx}{(2-5x)^2}, \quad |x| < \frac{2}{5} \text{ is}$$
$$\frac{1}{2} + \frac{7}{4}x + Ax^2 + \dots$$

(b) find the value of the constant  $k$ ,

(2)

(c) find the value of the constant  $A$ .

(2)

**(Total 9 marks)**

**Q5.**

(a) Find the binomial expansion of

$$\sqrt[3]{(8-9x)}, \quad |x| < \frac{8}{9}$$

in ascending powers of  $x$ , up to and including the term in  $x^3$ . Give each coefficient as a simplified fraction.

(6)

(b) Use your expansion to estimate an approximate value for  $\sqrt[3]{7100}$ , giving your answer to 4 decimal places. State the value of  $x$ , which you use in your expansion, and show all your working.

(3)

**(Total 9 marks)**

**Q6.**

(a) Find the binomial expansion of

$$\frac{1}{\sqrt{(9-10x)}}, \quad |x| < \frac{9}{10}$$

in ascending powers of  $x$  up to and including the term in  $x^2$ .

Give each coefficient as a simplified fraction.

(5)

(b) Hence, or otherwise, find the expansion of

$$\frac{3+x}{\sqrt{(9-10x)}}, \quad |x| < \frac{9}{10}$$

in ascending powers of  $x$ , up to and including the term in  $x^2$ .

Give each coefficient as a simplified fraction.

(3)

**(Total 8 marks)**



**Q7.**

(a) Use the binomial expansion to show that

$$\sqrt{\left(\frac{1+x}{1-x}\right)} \approx 1 + x + \frac{1}{2}x^2, \quad |x| < 1$$

(6)

(b) Substitute  $x = \frac{1}{26}$  into

$$\sqrt{\left(\frac{1+x}{1-x}\right)} = 1 + x + \frac{1}{2}x^2$$

to obtain an approximation to  $\sqrt{3}$

Give your answer in the form  $\frac{a}{b}$  where  $a$  and  $b$  are integers.

(3)

**(Total 9 marks)**

**Q8.**

(a) Use the binomial theorem to expand

$$(8-3x)^{\frac{1}{3}}, \quad |x| < \frac{8}{3},$$

in ascending powers of  $x$ , up to and including the term in  $x^3$ , giving each term as a simplified fraction.

(5)

(b) Use your expansion, with a suitable value of  $x$ , to obtain an approximation to  $\sqrt[3]{(7.7)}$ .  
Give your answer to 7 decimal places.

(2)

**(Total 7 marks)**

**Q9.**

$$\frac{2x^2 + 5x - 10}{(x-1)(x+2)} \equiv A + \frac{B}{x-1} + \frac{C}{x+2}$$

(a) Find the values of the constants  $A$ ,  $B$  and  $C$ .

(4)

(b) Hence, or otherwise, expand

$$\frac{2x^2 + 5x - 10}{(x-1)(x+2)}$$

in ascending powers of  $x$ , as far as the term in  $x^2$ . Give each coefficient as a simplified fraction.

(7)

**(Total 11 marks)**

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Q10.

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

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.

(ii) Find the range of values of  $x$  for which this expansion is valid.

(7)

(Total for question = 11 marks)