Test - Binomial expansion for rational n and series modelling

Year: Year 13 · Duration: 40 minutes · /20

Name:	Date:	**Mark: /20**

Question	1	2	3	4	5	Total
marks	4	4	4	4	4	**20**
Mark						

Show your working.

Question 1 (4 marks)

Question 1 – Expanding a quotient

Expand $\dfrac{1}{(2+x)^3}$ in ascending powers of x up to and including the term in x^2. State the values of x for which the expansion is valid. [4 marks]

Question 2 (4 marks)

Question 2 – Estimating a square root

(a) Expand $\sqrt{1-4x}$ up to and including x^3. [2 marks] (b) State the range of validity. [1 mark] (c) Use $x = 0.01$ to estimate $\sqrt{0.96}$ to 6 decimal places. [1 mark]

Question 3 (4 marks)

Question 3 – Partial fractions

$h(x) = \dfrac{4-x}{(1-x)(2+x)}$. (a) Write $h(x)$ in partial fractions. [2 marks] (b) Expand it in ascending powers of x up to and including x^3. [1 mark] (c) State the range of validity. [1 mark]

Question 4 (4 marks)

Question 4 – Finding a and n

In the expansion of $(1+ax)^n$ the coefficient of x is -3 and the coefficient of x^2 is $\dfrac{27}{4}$. (a) Find a and n. [2 marks] (b) Find the coefficient of x^3 and the range of validity. [2 marks]

Question 5 (4 marks)

Question 5 – A pendulum in a lift

A pendulum has period $T = 2\pi\sqrt{\dfrac{L}{g}}$. Because of a design change the effective gravity g is reduced by 4%, so the new period is $T_0(0.96)^{-1/2}$ where T_0 is the original period. (a) Expand $(1-x)^{-1/2}$ up to x^2 and use $x = 0.04$ to estimate $(0.96)^{-1/2}$ to 5 decimal places. [3 marks] (b) By what percentage does the period increase, to 1 decimal place? [1 mark]