Test - Functions, modulus and partial fractions

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 – Composite and inverse

The functions f and g are defined by $f(x) = 2x + 1$ and $g(x) = x^2 - 3$ for all real x. (a) Find $fg(x)$ and $gf(x)$. [2 marks] (b) Solve $gf(x) = 6$. [2 marks]

Question 2 (4 marks)

Question 2 – Modulus equation and inequality

(a) Solve $|3x - 2| = x + 4$. [3 marks] (b) Solve $|2x + 1| \leq 5$. [1 mark]

Question 3 (4 marks)

Question 3 – Partial fractions

(a) Express $\dfrac{5x + 3}{(x - 1)(x + 3)}$ in partial fractions. [2 marks] (b) Express $\dfrac{x^2}{(x - 1)(x + 1)}$ in partial fractions. [2 marks]

Question 4 (4 marks)

Question 4 – Range, solution and inverse

The function h is defined by $h(x) = |x - 2| + 1$, $x \in \mathbb{R}$. (a) State the range of h. [1 mark] (b) Solve $h(x) = 4$. [1 mark] (c) The function k is $h(x)$ for $x \geq 2$. Find $k^{-1}(x)$ and state its domain. [2 marks]

Question 5 (4 marks)

Question 5 – An oven cooling

After switching off, an oven cools according to $T = 25 + 175e^{-0.05t}$, where T is in °C

and t in minutes. (a) Find the temperature when it is switched off and the long-term temperature. [1 mark] (b) Find the time for the oven to reach 100 °C, to 3 significant figures. [2 marks] (c) State the domain of the inverse function. [1 mark]