1.2 Pure: Algebra and Functions: 30-minute Pack

EDEXCEL 9MA0 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Simplify the following algebraic fractions, giving each answer in its simplest form. State any values of x for which the fractions are undefined.

(a) Simplify fully $(x^2 - 9)/(x^2 + x - 6)$. **(3)**

(b) Hence, or otherwise, simplify $(x^2 - 9)/(x^2 + x - 6) / ((2x - 4)/(x + 3))$, giving your answer as a single fraction in its simplest form. **(4)**

(Total for Question 1 is 7 marks)

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2 Solve the equation $x^2 - 7x + 10 = 0$.

(Total for Question 2 is 2 marks)

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3 Functions f and g are defined by $f(x) = 2/(x - 1)$, x is real, x not equal to 1, and $g(x) = x^2 + 4$, x is real.

(a) State the range of g. **(1)**

(b) Find the value of fg(3). **(2)**

(c) Find $f^{-1}(x)$, the inverse function of f, stating its domain. **(4)**

(d) Show that $gf(x) \geq 4$ for all x in the domain of f, without finding an explicit expression for gf(x). **(2)**

(Total for Question 3 is 9 marks)

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4 The line l has equation $y = -6x - 4$ and the curve C has equation $y = x^2 - 4x - 4$. The line meets the curve at the points A and B.

(a) Show that the x coordinates of A and B satisfy $x^2 + 2x = 0$. **(2)**

(b) Hence find the coordinates of A and B. **(3)**

(c) Find the exact length of AB. **(3)**

(Total for Question 4 is 8 marks)

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Mark scheme · 1.2 Pure: Algebra and Functions: 30-minute Pack

Question 1

(a) factorises numerator as (x-3)(x+3)	**M1**
(a) factorises denominator as (x+3)(x-2)	**M1**
(a) (x-3)/(x-2) cao, x not equal to -3, 2	**A1**
(a) Answer: (x - 3)/(x - 2), x not equal to -3 or 2	
(b) rewrites division as multiplication by the reciprocal (x+3)/(2x-4)	**M1**
(b) uses result of part (a) and factorises 2x - 4 as 2(x-2)	**M1**
(b) correct combined fraction $(x-3)(x+3)/[2(x-2)^2]$	**A1**
(b) $(x^2 - 9)/(2(x-2)^2)$ oe (e.g. $(x-3)(x+3)/(2(x-2)^2)$), fully simplified, cao	**A1**
(b) Answer: $(x^2 - 9)/(2(x - 2)^2)$	

Question 2

factorises (x - 2)(x - 5)	**M1**
x = 2 or x = 5 cao	**A1**
Answer: x = 2 or x = 5	

Question 3

(a) g(x) ≥ 4 oe	**B1**
(a) Answer: g(x) ≥ 4	
(b) finds g(3) = 13	**M1**
(b) fg(3) = 1/6 cao	**A1**
(b) Answer: 1/6	
(c) sets y = 2/(x-1) and attempts to make x the subject, e.g. y(x-1) = 2	**M1**
(c) correctly isolates x, x = 1 + 2/y	**dM1**
(c) $f^{-1}(x) = 1 + 2/x$ oe cao	**A1**
(c) domain x not equal to 0 (ft from range of f)	**B1ft**
(c) Answer: $f^{-1}(x) = 1 + 2/x$, x not equal to 0	
(d) recognises that $g(t) = t^2 + 4 \geq 4$ for any real number t, since $t^2 \geq 0$	**B1**
(d) correct conclusion: since f(x) is real for all x not equal to 1, gf(x) = g(f(x)) ≥ 4 for all such x, cso	**B1**
(d) Answer: gf(x) ≥ 4 for all x not equal to 1 (shown)	

Question 4

(a) equates the two expressions for y	**M1**
(a) rearranges to $x^2 + 2x = 0$ (cso)	**A1**
(a) Answer: $x^2 + 2x = 0$	
(b) solves the quadratic by factorising or the formula	**M1**
(b) x = -2 and x = 0	**A1**
(b) y values 8 and -4, giving (-2, 8) and (0, -4)	**A1**
(b) Answer: A(-2, 8), B(0, -4)	
(c) uses the distance formula	**M1**
(c) $AB^2 = 4 + 144 = 148$	**M1**
(c) $AB = 2\sqrt{37}$	**A1**
(c) Answer: $AB = 2\sqrt{37}$	

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