

Functions

Question Paper

Level	Pre U
Subject	Maths
Exam Board	Cambridge International Examinations
Topic	Functions
Booklet	Question Paper

Time Allowed: 40 minutes

Score: /33

Percentage: /100

Grade Boundaries:

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- 1** Let $f(x) = x^2$ and $g(x) = 7x - 2$ for all real values of x .
- (i) Give a reason why f has no inverse function. [1]
 - (ii) Write down an expression for $gf(x)$. [2]
 - (iii) Find $g^{-1}(x)$. [2]
 - (iv) Explain the relationship between the graph of $y = g(x)$ and $y = g^{-1}(x)$. [2]
- 2** Let $f(x) = x^2$ and $g(x) = 7x - 2$ for all real values of x .
- (i) Give a reason why f has no inverse function. [1]
 - (ii) Write down an expression for $gf(x)$. [2]
 - (iii) Find $g^{-1}(x)$. [2]
- 3** The function f is defined by $f : t \mapsto 2 \sin t + \cos 2t$ for $0 \leq t < 2\pi$.
- (i) Show that $\frac{df}{dt} = 2 \cos t(1 - 2 \sin t)$. [2]
 - (ii) Determine the range of f . [5]
- A curve C is given parametrically by $x = 2 \cos t + \sin 2t$, $y = f(t)$ for $0 \leq t < 2\pi$.
- (iii) Show that $x^2 + y^2 = 5 + 4 \sin 3t$. [3]
 - (iv) Deduce that C lies between two circles centred at the origin, and touches both. [2]
 - (v) Find the gradient of the tangent to C at the point at which $t = 0$. [3]
- 4** Let $f(x) = x^2(x - 2)$ and $g(x) = 2x - 1$ for all real x .
- (i) Sketch the graph of $y = f(x)$ and explain briefly why the function f has no inverse. [2]
 - (ii) Write down $g^{-1}(x)$. [1]
 - (iii) On the same diagram, sketch the graphs of $y = f(x - 1) - 3$ and $y = g^{-1}(x)$ and state the number of real roots of the equation $f(x - 1) - 3 = g^{-1}(x)$. [3]