IB MATHS AI SL · UNIT 2

Functions: Domain, Range & Inverses: exam practice

10 questions · 38 marks · worked solutions and markschemes

Name _____ Date _____ Score / 38

- Answer every question before you look at the solutions. They start after the last question, with the marks for each line: M for method, A for accuracy, R for reasoning.
- Online, with more practice: ibmathrevision.com/slai/functions-domain-range-and-inverses-exam-practice

1. **3 marks · Paper 1 style · calculator allowed**

Let $f(x) = x^2 - 4x$, for $0 \leq x \leq 5$.

Find the range of f. **[3]**

2. **3 marks · Paper 1 style · calculator allowed**

Let $h(x) = \dfrac{5}{x-2}$.

(a) Write down the value of x that is not in the domain of h. **[1]**

(b) Write down the value that $h(x)$ cannot take. **[1]**

(c) Find $h(7)$. **[1]**

3. **3 marks · Paper 1 style · calculator allowed**

The cost, C euros, of printing n T-shirts is $C(n) = 2.5n + 40$.

(a) Find the inverse function, giving the number of T-shirts in terms of the cost. **[2]**

(b) Find the number of T-shirts printed for €115. **[1]**

4. **5 marks · Paper 1 style · calculator allowed**

Let $f(x) = 2x + 3$, for $-1 \leq x \leq 4$.

(a) Find the range of f. **[2]**

(b) Find $f^{-1}(x)$ and write down its domain. **[3]**

5. **3 marks · Paper 1 style · calculator allowed**

The temperature in degrees Fahrenheit, F, is related to the temperature in degrees Celsius, C, by $F(C) = 1.8C + 32$.

(a) Find the inverse function $C(F)$. **[2]**

(b) Find the temperature in Celsius when $F = 98.6$. **[1]**

6. **4 marks · Paper 1 style · calculator allowed**

Let $f(x) = 3x - 6$.

1. Find $f(4)$. **[1 mark]**
2. Find an expression for the inverse function $f^{-1}(x)$. **[2 marks]**
3. Find $f^{-1}(9)$. **[1 mark]**

7. **4 marks · Paper 1 style · calculator allowed**

Let $g(x) = \frac{x}{2} + 3$.

1. Find an expression for $g^{-1}(x)$. **[2 marks]**
2. Find the value of x for which $g(x) = g^{-1}(x)$. **[2 marks]**

8. **4 marks · Paper 1 style · calculator allowed**

Let $g(x) = x^2 + 1$, for $x \geq 0$.

(a) Write down the range of g. **[1]**

(b) Find $g^{-1}(x)$. **[2]**

(c) Find $g^{-1}(10)$. **[1]**

9. **5 marks · Paper 1 style · calculator allowed**

Let $f(x) = \sqrt{x-3}$.

(a) Write down the largest possible domain of f. **[1]**

(b) Write down the range of f. **[1]**

(c) Find $f^{-1}(x)$, stating its domain. **[3]**

10. **4 marks · Paper 1 style · calculator allowed**

Consider the rational function $g(x) = \frac{x+2}{2x-1}$.

1. State the equation of the vertical asymptote of the graph of g.
2. State the equation of the horizontal asymptote of the graph of g.

Answers and worked solutions

Question 1

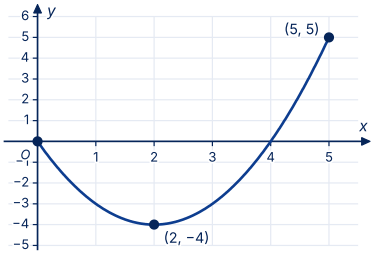
3 marks

Answer: $-4 \le f(x) \le 5$

minimum $f(2) = -4$ A1

$f(0) = 0$, $f(5) = 5$ (M1)

$-4 \le f(x) \le 5$ A1



Range $-4 \le f(x) \le 5$

Question 2

3 marks

Answer: (a) $x = 2$; (b) 0; (c) 1

(a)

$x = 2$ A1

(b)

0 A1

(c)

1 A1

Question 3

3 marks

Answer: (a) $n = \dfrac{C - 40}{2.5}$; (b) 30

(a)

$C - 40 = 2.5n$ (M1)

$n = \dfrac{C - 40}{2.5}$ A1

(b)

30 A1

Question 4

5 marks

Answer: (a) $1 \le f(x) \le 11$; (b) $f^{-1}(x) = \dfrac{x - 3}{2}$, $1 \le x \le 11$

(a)

$f(-1) = 1$, $f(4) = 11$ (M1)

$1 \le f(x) \le 11$ A1

(b)

$x = 2y + 3$ M1

$f^{-1}(x) = \dfrac{x - 3}{2}$ A1

$1 \le x \le 11$ A1

Question 5

3 marks

Answer: (a) $C(F) = \dfrac{F - 32}{1.8}$; (b) $37\,°\text{C}$

(a)

$F - 32 = 1.8C$ (M1)

$C = \dfrac{F - 32}{1.8}$ A1

(b)

37 A1

Question 6

4 marks

Answer: (a) 6; (b) $(x + 6)/3$; (c) 5

1. $f(4) = 12 - 6 = 6$ A1
2. f multiplies by 3 then subtracts 6; f^{-1} adds 6 then divides by 3 M1
   $f^{-1}(x) = \dfrac{x + 6}{3}$ A1
3. $f^{-1}(9) = \dfrac{15}{3} = 5$ A1

Question 7

4 marks

Answer: (a) $2x - 6$; (b) 6

1. g halves then adds 3; g^{-1} subtracts 3 then doubles M1
   $g^{-1}(x) = 2(x - 3) = 2x - 6$ A1
2. $\dfrac{x}{2} + 3 = 2x - 6$ M1
   $9 = 1.5x \Rightarrow x = 6$ A1

Question 8

4 marks

Answer: (a) $g(x) \ge 1$; (b) $g^{-1}(x) = \sqrt{x - 1}$; (c) 3

(a)

$g(x) \ge 1$ A1

(b)

$x = y^2 + 1$ (M1)

$g^{-1}(x) = \sqrt{x - 1}$ A1

(c)

3 A1

Question 9

5 marks

Answer: (a) $x \ge 3$; (b) $f(x) \ge 0$; (c) $f^{-1}(x) = x^2 + 3$, $x \ge 0$

(a)

$x \ge 3$ A1

(b)

$f(x) \ge 0$ A1

(c)

$x = \sqrt{y - 3}$ (M1)

$f^{-1}(x) = x^2 + 3$ A1

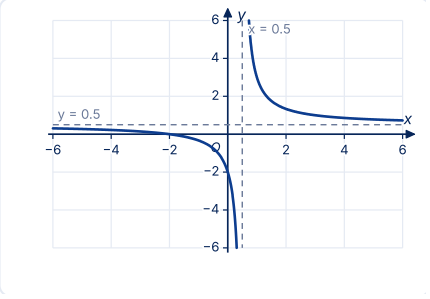
$x \ge 0$ A1

Question 10

4 marks

Answer: (a) $x = 0.5$; (b) $y = 0.5$

1. Set the denominator equal to zero: $2x - 1 = 0$ M1
   Vertical asymptote: $x = 0.5$ A1
2. As $x \to \pm\infty$, $g(x) \to \frac{x}{2x} = 0.5$ M1
   Horizontal asymptote: $y = 0.5$ A1



Asymptotes $x = 0.5$ and $y = 0.5$

Every solution is also on ibmathrevision.com/slai/functions-domain-range-and-inverses-exam-practice
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