

IB Maths AA HL Unit 2 Functions Practice Exam

IB Mathematics: Analysis and Approaches HL · 11 questions · 60 marks

Name _____

Date _____

Score / 60

- Answer every question. Show your working: most marks are for method.
- Section A no calculator; Section B calculator allowed. Includes core questions from the SL AA unit, which HL students also sit.
- Topics: Solving and Roots; Modelling and Graphing Functions; Sketching and Displaying Graphs; Rational Function Asymptotes; Function Types and Inverses; Graph Properties.
- The mark scheme is a separate free PDF: ibmathrevision.com/downloads/practice-exams/hlaa/ib-maths-aa-hl-unit-2-functions-practice-exam-mark-scheme.pdf

Section A: no calculator

1. Solve the inequality $x^2 - 2x - 15 < 0$. [3]

2. Let $f(x) = 3e^x + 1$ and $g(x) = \ln(x - 2)$. [4]

- Write down the range of f . [1]
- Write down the domain of g and the equation of its vertical asymptote. [2]
- Find the x -intercept of the graph of g . [1]

3. Let $g(x) = 2^x - 4$. [5]

- Find the coordinates of the points where the graph of g meets the axes. [2]
- Write down the equation of the horizontal asymptote. [1]
- Sketch the graph of $y = g(x)$, showing the asymptote and the intercepts. [2]



4. Let $f(x) = e^{2x} - 3$, $x \in \mathbb{R}$. [4]

a. Find $f^{-1}(x)$. [2]

b. Write down the domain of f^{-1} . [1]

c. Describe the geometric relationship between the graphs of f and f^{-1} . [1]

5. Let $f(x) = \frac{x^2 + x - 2}{x - 3}$, $x \neq 3$. [10]

a. Write down the equation of the vertical asymptote. [1]

b. Show that $f(x) = x + 4 + \frac{10}{x - 3}$ and hence write down the equation of the oblique asymptote. [3]

c. Find the coordinates of the stationary points of the graph of f . [4]

d. Hence state the range of f . [2]

6. Let $g(x) = \frac{2x + 1}{x - 2}$, $x \neq 2$, and $h(x) = x^2 - 4x$, $x \geq c$. [9]

a. Show that g is self-inverse. [2]

b. Find the least value of c for which h^{-1} exists. [2]

c. For this value of c , find $h^{-1}(x)$ and state its domain. [3]

d. Determine whether h is odd, even or neither on $\mathbb{R}$, justifying your answer. [2]



Section B: calculator allowed

7. Let $f(x) = x^3 - 6x^2 + 9x + 1$. [4]
- Use technology to find the coordinates of the local maximum and local minimum points. [2]
 - Write down the range of f for $0 \leq x \leq 4$. [2]
8. Let $f(x) = \ln(x + 2)$ and $g(x) = 0.5x^2 - 1$. [4]
- Write down the domain of f . [1]
 - Find the x -coordinates of the points where the graphs of f and g intersect. [2]
 - Hence solve $\ln(x + 2) > 0.5x^2 - 1$. [1]
9. Let $h(x) = \frac{x^2}{4} + \frac{8}{x}$, for $x \neq 0$. [6]
- Write down the equation of the vertical asymptote of the graph of h . [1]
 - Find the coordinates of the local minimum point for $x > 0$. [2]
 - Find the x -intercept. [1]
 - Sketch the graph of $y = h(x)$ for $-6 \leq x \leq 6$, showing the features found above. [2]
10. Let $f(x) = \frac{x^2 - 4}{x - 1}$, for $x \neq 1$. [5]
- Write down the zeros of f . [1]
 - Write down the equation of the vertical asymptote. [1]
 - The line $y = 3$ meets the graph of f at two points. Find their x -coordinates. [3]



- 11.** The temperature of a cup of coffee, T °C, t minutes after it is made is modelled by **[6]**
 $T(t) = 20 + 70e^{-0.08t}$, $t \geq 0$.
- a. Write down the initial temperature. **[1]**
 - b. Find the temperature after 10 minutes. **[1]**
 - c. Find the time taken for the coffee to cool to 50 °C. **[2]**
 - d. Write down the equation of the horizontal asymptote of the graph of T and interpret it in context. **[2]**

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