

IB Maths AA SL Unit 5 Calculus Practice Exam: Mark Scheme

IB Mathematics: Analysis and Approaches SL · 9 questions · 53 marks

- M marks are for a correct method; A marks for an accurate answer that follows a correct method; R marks are for clear reasoning; AG means the answer is given in the question, so the working must be complete.
- Accept any correct method that reaches a correct answer, unless the question says which method to use.
- Practise these topics online with instant feedback: ibmathrevision.com/SLAAUnit5

Section A: no calculator

Question 1

4 marks

- a. $3x^2 - 12$ **A1**
 b. $3x^2 - 12 < 0$ **M1**
 $-2 < x < 2$ **A1A1**

Question 2

10 marks

- a. $a + b = -1$ **A1**
 $3a + 2b = 0$ **A1**
 b. solving **(M1)**
 $a = 2, b = -3$ **A1A1**
 c. $6x^2 - 6x = 0$ **(M1)**
 $(0, 0)$ **A1**
 d. $y(2) = 16 - 12 = 4$, gradient $24 - 12 = 12$ **A1A1**
 $y = 12x - 20$ **A1**

Question 3

3 marks

$$\int (1 - 2x^{-2}) dx \text{ **M1**}$$

$$x + 2x^{-1} + c \text{ **A1A1**}$$

Question 4

8 marks

- a. $\frac{dy}{dx} = 2x - 4 = 2$ at $x = 3$ **M1A1**
 $y = 2x - 2$ **A1**
 b. gradient $-\frac{1}{2}$ **(A1)**
 $y = -\frac{1}{2}x + \frac{11}{2}$ **A1**
 c. $x^2 - 4x + 7 = -\frac{1}{2}x + \frac{11}{2}$ **M1**
 $2x^2 - 7x + 3 = 0 \implies x = \frac{1}{2}$ **A1**
 $Q\left(\frac{1}{2}, \frac{21}{4}\right)$ **A1**



Question 5

8 marks

- a. $\frac{d}{dx} \sqrt{2x+1} = \frac{1}{\sqrt{2x+1}}$ **A1**
 $h'(x) = \sqrt{2x+1} + \frac{x}{\sqrt{2x+1}}$ **M1A1**
 $= \frac{2x+1+x}{\sqrt{2x+1}} = \frac{3x+1}{\sqrt{2x+1}}$ **AG**
- b. $3x+1=0$ **(M1)**
 $x = -\frac{1}{3}$ **A1**
- c. $h(4) = 12, h'(4) = \frac{13}{3}$ **A1A1**
 $y - 12 = \frac{13}{3}(x - 4)$ **A1**

Question 6

6 marks

- a. $y = x^4 + x^{-2} + c$ **M1A1A1**
 $6 = 1 + 1 + c \implies c = 4$ **M1**
 $y = x^4 + \frac{1}{x^2} + 4$ **A1**
- b. $16 + \frac{1}{4} + 4 = \frac{81}{4}$ **A1**

Question 7

7 marks

- a. $\frac{\frac{1}{2+h} - \frac{1}{2}}{h}$ **M1**
 $= \frac{2 - (2+h)}{2h(2+h)}$ **A1**
 $= -\frac{1}{2(2+h)}$ **AG**
- b. as $h \rightarrow 0$, the chord gradient tends to the tangent gradient **R1**
 $f'(2) = -\frac{1}{4}$ **A1**
- c. $y - \frac{1}{2} = -\frac{1}{4}(x - 2)$ **M1**
 $y = -\frac{1}{4}x + 1$ **A1**
- d. $-\frac{1}{4}$: f is decreasing at $x = 2$ **A1**

Section B: calculator allowed**Question 8**

3 marks

- a. 2.55 **A2**
- b. the area between the graph of f , the x -axis and the line $x = 4$ **A1**

Question 9

4 marks

- a. 4 **A1**
- b. $\int_{-1}^3 |f(x)| dx$ (or splitting at $x = 0$ and $x = 2$) **(M1)**
 $= 12$ **A1**
- c. parts of the region lie below the x -axis and contribute negatively to the integral **R1**



