

**As a guideline this paper should be completed in 1 hour.**

**No Calculator to be used in this examination.**

**Section A [29 marks]**

1. [Maximum mark 6]

Given that  $f(x) = (3x - 9)^4$ , find

a)  $f'(x)$ ;

b)  $\int f(x) dx$ .

2. [Maximum mark 5]

Write the equation  $x^2 + 5x + 2$  in the form  $(x + p)^2 + q$ .

3. [Maximum mark 5]

Let  $A = \begin{pmatrix} 1 & -3 \\ 2 & 0 \end{pmatrix}$ .

a) Find  $A^2$ .

b) Let  $B = \begin{pmatrix} -6 & 3 \\ 8 & 20 \end{pmatrix}$ .

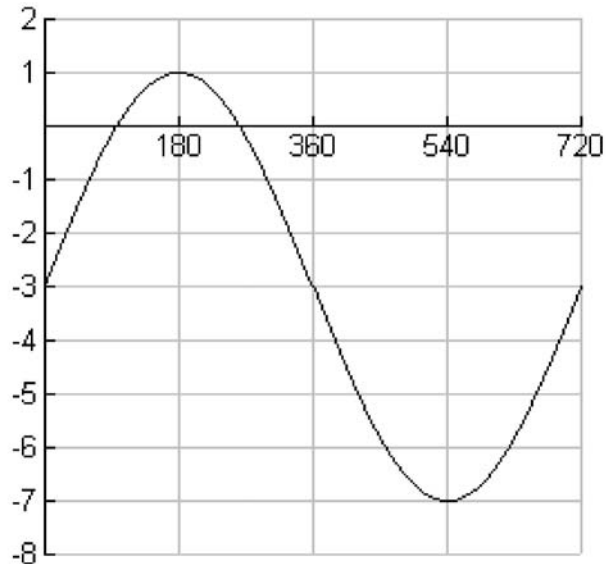
Find matrix  $X$  such that  $5X - A = B$ .

4. [Maximum mark 3]

A bag contains some sweets. There 4 toffees, 2 fruit jellies and 2 chocolates. Two sweets are picked at random. What is the probability that the two sweets of the same type?

5. [Maximum mark 4]

The graph below shows the curve of  $y = 4 \sin\left(\frac{1}{2}x\right) - p$ .



- Find the amplitude of the function.
  - Find the period of the function.
  - Find the value of  $p$ .
6. Find the equation of the tangent to the curve  $y = e^{\frac{x}{2}}$  at the point where  $x=0$ .

Give your answer in the form  $ax + by + c = 0$ .

## Section B [31 marks]

7. [Maximum mark 19]

The functions  $f$  and  $g$  are defined as  $f(x) = 4x - 1$  and  $g(x) = 3 - 2x$ .

i) Find  $f^{-1}$  and  $g^{-1}$ . [4 marks]

ii) Show that  $(f \circ g^{-1}) = 5 - 2x$ . [2 marks]

iii) Find  $(g \circ f^{-1})$ . [2 marks]

iv) Sketch the graph of  $y = \frac{(f \circ g^{-1})}{f}$ , for  $-6 \leq x \leq 6$  and  $-6 \leq y \leq 4$ .

Write the equations of any asymptotes. [5 marks]

v) Let  $h(x) = \frac{(f \circ g^{-1})}{f}$ .

a) Find  $h'(x)$ . [3 marks]

b) Find  $h''(x)$ . [3 marks]

8. [Maximum mark 12]

In a boys school of 240 students can opt to do either rugby, baseball, both, or neither. The letter  $r$  represents rugby and  $b$  represent baseball.

It is known that  $n(r \cap b) = 60$ ,  $n(r' \cap b) = 120$ , and  $n(r \cup b) = 210$ .

i) Draw a Venn diagram to represent this information. [3 marks]

ii) Given that a student opts to take rugby, find the probability that he does not do baseball. [2 marks]

iii) Given that a student does not do rugby, find the probability that he does not do any sport. [2 marks]

- iv) State with a reason if the choices of rugby and baseball are mutually exclusive. *[1 mark]*
  
- v) State, showing your mathematical working, if the choices of baseball and rugby are independent. *[4 marks]*

# Paper D

# IB SL Paper 1 Practice Papers

## Answers

1. a)  $f'(x) = 12(3x - 9)^3$

b)  $\frac{(3x - 9)^5}{15} + c$

2.  $\left(x + \frac{5}{2}\right)^2 - \frac{17}{4}$

3. a)  $\begin{pmatrix} -5 & -3 \\ 2 & -6 \end{pmatrix}$

b)  $\begin{pmatrix} -1 & 0 \\ 2 & 4 \end{pmatrix}$

4.  $\frac{2}{7}$

5. a) 4

b)  $720^\circ$

c)  $p=3$

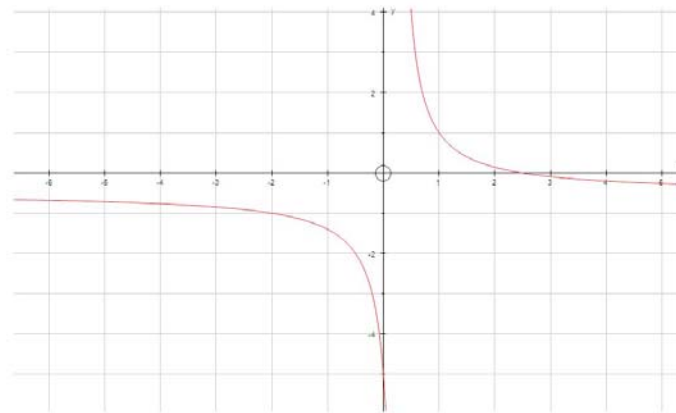
6.  $x - 2y + 2 = 0$

7. i)  $f^{-1}(x) = \frac{x+1}{4}$        $g^{-1}(x) = \frac{3-x}{2}$

ii)  $5-2x$

iii)  $\frac{5}{2} - \frac{x}{2}$  or  $\frac{5-x}{2}$

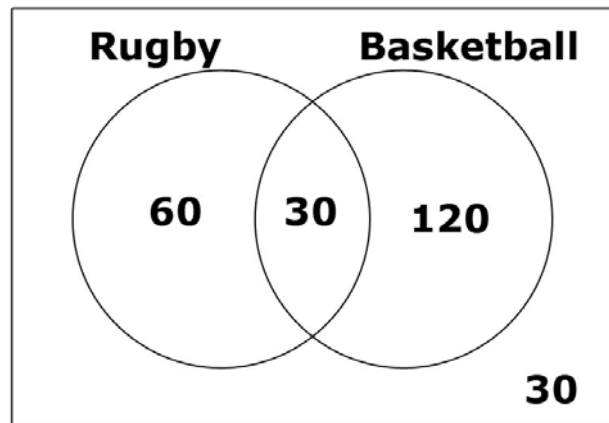
iv)



Asymptotes are  $x = \frac{1}{4}$  and  $y = 0.2$

v) a)  $h'(x) = \frac{-19}{2(4x-1)^2}$       b)  $h'(x) = \frac{-76}{(4x-1)^3}$

8. i)



ii)  $\frac{2}{3}$

iii)  $\frac{1}{5}$

iv) Not mutually exclusive as  $(A \cap B) \neq 0$ .

v) Not independent as  $P(A \cap B) \neq P(A)P(B)$ .