



# SEKOLAH BUKIT SION

## Final Examination 2021

STUDENT  
NAME

EXAM  
NUMBER

CLASS

---

### 0606 ADDITIONAL MATHEMATICS

Year 10

2 June 2021

2 hours

Additional Materials:

- Scientific Calculator
- Ruler

---

#### READ THESE INSTRUCTIONS FIRST

Write your name, exam number and grade on all the work you hand in.

Write in dark blue or black pen.

Use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks for this paper is 80.

**PDF Filename format:** *Class\_Name\_FinalExam*

Score :

---

This document consists of 7 printed pages including this page.

1

A curve has equation  $y = (3x - 5)^3 - 2x$ .

(a) Find, in simplest form,  $\frac{dy}{dx}$  and  $\frac{d^2y}{dx^2}$  [4]

(b) Find the exact value of the **x-coordinate** of each of the stationary points of the curve. [2]

(c) Use the second derivative test to determine the nature of each of the stationary points. [2]

---

2

**Do not use a calculator and show all necessary steps.**

(a) Show that  $(\sqrt{5} - 3)^2$  will simplify to  $14 - 6\sqrt{5}$ . [1]

(b) Hence, express  $\frac{(\sqrt{5} - 3)^2}{\sqrt{5} + 1}$  in the form of  $p\sqrt{5} + q$ , where  $p$  and  $q$  are integers. [4]

---

3

Find the values of  $k$  for which the equation  $(k - 1)x^2 + kx - k = 0$  has real roots. [4]

---

4

(a) Given that  $(x - 2)$  is a factor of  $ax^3 - 12x^2 + 5x + 6$ ,  
use the factor theorem to show that  $a = 4$ . [2]

(b) Calculate the remainder when  $4x^3 - 12x^2 + 5x + 6$  is divided by  $(x - 3)$ . [1]

(c) Showing all your working, factorise  $4x^3 - 12x^2 + 5x + 6$  completely.  
Hence, solve  $4x^3 - 12x^2 + 5x + 6 = 0$ . [4]

---

5

(a) Express  $5x^2 - 20x + 1$  in the form of  $p(x + q)^2 + r$ , where  $p$ ,  $q$  and  $r$  are constants. [3]

(b) Hence, state the least value of  $5x^2 - 20x + 1$  and the value of  $x$  at which this occurs. [1]

---

6 Solve each. Express your answer in **exact values of  $x$** .

(a)  $\log_3 x = 5$  [1]

(b)  $5^{x+2} = 12$  [2]

(c)  $e^{2x-1} = 6$  [2]

(d)  $\lg(8 - x) = \lg(3x + 2)$  [2]

(e)  $\log_4(3y^2 - 10) = 2 \log_4(y - 1) + \frac{1}{2}$  [4]

**CHOOSE ANY ONE OF THE FOLLOWING.**

(f)  $\log_3(2x + 1) = 2 + \log_3(3x - 11)$  [4]

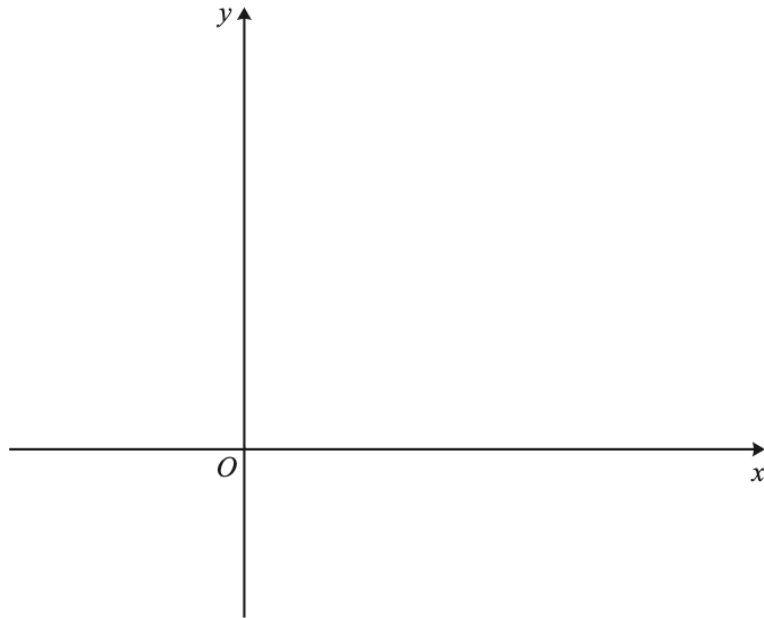
(g)  $2(5^x) - 5^{-x} = 3$ . [4]

(h)  $2 \lg(x + 2) + \lg 4 = \lg x + 4 \lg 3$  [4]

---

7

- (a) Sketch the graph of  $y = |4x - 2|$  on the axes below, showing the coordinates of the points where the graph meets the axes. [3]



- (b) Solve the equation  $|4x - 2| = x$ . [3]

---

8

- Write  $\frac{y \times (4x^3)^2}{(64y^3)^{\frac{1}{2}}}$  in the form  $2^a \times x^b \times y^c$ , where  $a$ ,  $b$  and  $c$  are constants. [3]

---

9

- Find the values of  $x$  for which  $6x^2 + 7x \geq 20$ . [3]

10

Given that  $7^x \times 49^y = 1$  and  $5^{5x} \times 125^{\frac{2y}{3}} = \frac{1}{25}$ , **show that value of**  $x = -\frac{1}{2}$  **and**  $y = \frac{1}{4}$ . [3]

*(Please be warned that **showing** means to solve for  $x$  and  $y$  values as if there are not known. **Showing** is **NOT checking** by direct substitution of the given  $x$  and  $y$  values.)*

---

11

(a) By finding  $f^{-1}(x)$ , show that  $f(x) = \frac{3x-1}{2x-3}$  for  $x \in \mathbb{R}$ ,  $x \neq \frac{3}{2}$  is a self-inverse function.

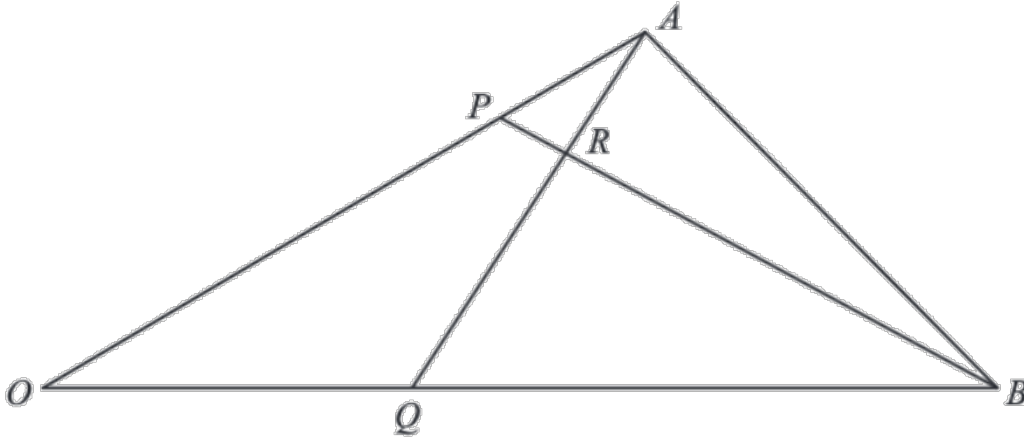
*[A self-inverse function is such that  $f(x) = f^{-1}(x)$ .]* [3]

(b) Given that  $f(x) = x^2 - 3$  for  $x \in \mathbb{R}$  and  $g(x) = 3x + 2$  for  $x \in \mathbb{R}$ .

Solve the equation  $gf(x) = f^{-1}(x)$ . [3]

---

The position vectors of points  $A$  and  $B$  relative to an origin  $O$  are  $\mathbf{a}$  and  $\mathbf{b}$  respectively.  
 The point  $P$  is such that  $\overrightarrow{OP} = \mu\overrightarrow{OA}$ . The point  $Q$  is such that  $\overrightarrow{OQ} = \lambda\overrightarrow{OB}$ .  
 The lines  $AQ$  and  $BP$  intersect at the point  $R$ .



(a) Express  $\overrightarrow{AQ}$  in terms of  $\lambda$ ,  $\mathbf{a}$  and  $\mathbf{b}$ . [1]

(b) Express  $\overrightarrow{BP}$  in terms of  $\mu$ ,  $\mathbf{a}$  and  $\mathbf{b}$ . [1]

It is given that  $3\overrightarrow{AR} = \overrightarrow{AQ}$  and  $8\overrightarrow{BR} = 7\overrightarrow{BP}$ .

(c) Express  $\overrightarrow{OR}$  in terms of  $\lambda$ ,  $\mathbf{a}$  and  $\mathbf{b}$ . [2]

(d) Express  $\overrightarrow{OR}$  in terms of  $\mu$ ,  $\mathbf{a}$  and  $\mathbf{b}$ . [2]

(e) Hence find the value of  $\mu$  and  $\lambda$ . [3]

**EITHER**

It is given that  $y = (x^2 + 1)(2x - 3)^{\frac{1}{2}}$ .

(a) Show that  $\frac{dy}{dx} = \frac{Px^2 + Qx + 1}{(2x-3)^{\frac{1}{2}}}$ , where  $P$  and  $Q$  are integers. [4]

(b) Hence find the equation of the normal to the curve  $y = (x^2 + 1)(2x - 3)^{\frac{1}{2}}$  at the point  $x = 2$ , giving your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$ , and  $c$  are integers. [4]

**OR**

(a) Find  $\frac{dy}{dx}$  of  $y = \frac{4x^2+1}{2x-3}$ . [3]

(b) Differentiate  $y = (3x^2 - 1)^{\frac{1}{3}}$  with respect to  $x$ .  
Find the equation of the tangent to the curve  $y = (3x^2 - 1)^{\frac{1}{3}}$  at the point where  $x = \sqrt{3}$ . [5]

---

**\*\* END OF EXAMINATION \*\***