# SEKOLAH BUKIT SION

## High School Semester 2 Examination

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| **STUDENT NAME** | | | |
| **EXAM NUMBER** | | **CLASS** | |

## ADDITIONAL MATHEMATICS 0606

**Year 10**

**6 June 2022**

**120 minutes**

Students answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments

**READ THESE INSTRUCTIONS FIRST.**

- Answer all questions.
- Use a black or dark blue pen.
- Use HB pencil for any diagrams or graphs.
- Write your name, class and candidate number in the boxes provided in each page.
- Write your answer to each question in the space provided.
- Do not use an erasable pen or correction fluid or tape.
- You may use a scientific calculator where appropriate.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- Use the calculator value of $\pi$ or 3.142.

INFORMATION:

- The total number of marks in this paper is 80.
- The number of marks for each question or part question is shown in brackets [].

| SCORE: |
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**1** A function is such that $g(x) = \frac{1}{2x-1}$ for $1 \leq x \leq 3$.

**(a)** Find the range of g.

*Answer*: ……..…… [1]

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

*Answer*: ……..…… [2]

**(c)** Solve $g^2(x) = 3$.

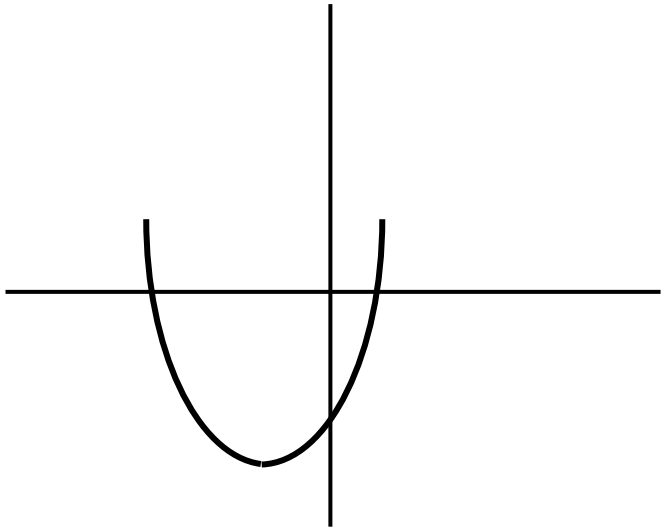
*Answer*: ……..…… [3]

**2**

**(a)** Use the completing the square method to express $2x^2 + 5x - 7$ in the form $a(x + b)^2 + c$.

*Answer*: …… [3]

**(b)** Below is the sketch the graph of $y = 2x^2 + 5x - 7$.



**(a)** Write down the coordinates of its minimum point.

*Answer*: …… [1]

**(b)** Find the range of values of $x$ for which $2x^2 + 5x - 7 < 0$.

*Answer*: …… [1]

**3** Solve the simultaneous equations

$$2x = y + 3 \qquad 2x^2 + y = 7x$$

*Answer*: …… [4]

**4**

**(a)** Simplify $\frac{2^{x-3}\times 8^{x+2}}{16^{x+1}\times 4^{2x}}$ .

*Answer*: …… [3]

**(b) Without using calculator**, simply $\frac{1+\sqrt{2}}{2\sqrt{2}-3}$ in the form $a + b\sqrt{2}$.

*Answer*: …… [4]

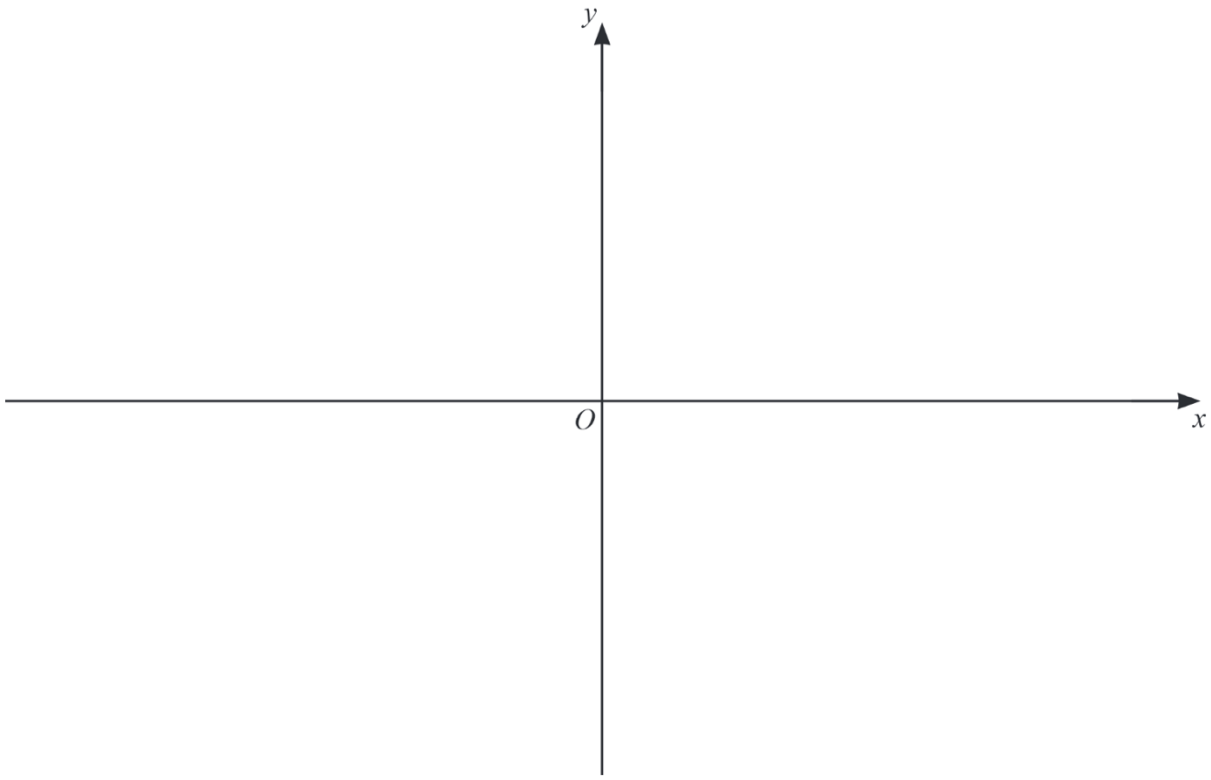
**5** Given that $f(x) = 3x^3 + ax^2 + bx + 2$ has a factor of $(x + 2)$ and leaves a remainder of 36 when divided by $(x – 2)$, find the value of $a$ and $b$.

Hence, factorise $f(x)$ completely and show that is quadratic factor is always positive for all real values of $x$.

*Answer*: …… [8]

**6** On the axes below, sketch the graph of $y = |(x - 2)(x + 1)(x + 2)|$ showing all the points where the curve meets the axes.

[3]



**7**

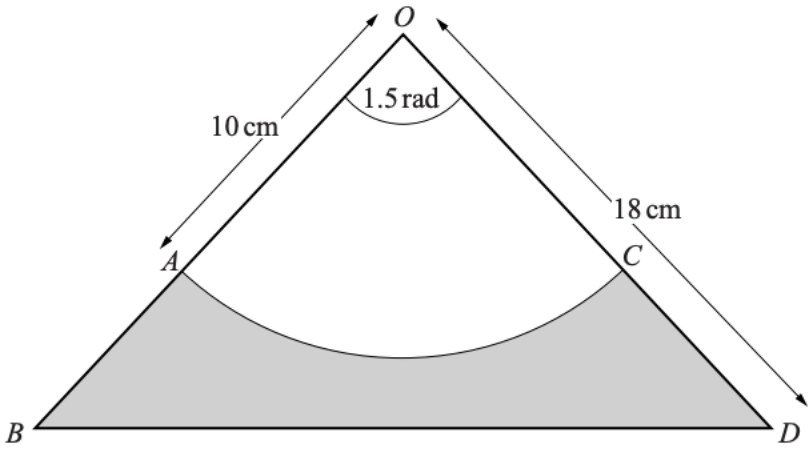
**(a)** Given that $\frac{e^x-2e^{-x}}{2e^x+e^{-x}} = \frac{1}{5}$, find the value of $x$ in the form of $\frac{1}{2}\ln a$.

*Answer*: …… [4]

**(b)** Solve $\log_7 x + 2\log_x 7 = 3$.

*Answer*: …… [3]

**8**




The diagram shows an isosceles triangle $OBD$ in which $OB = OD = 18$ cm.
Angle $BOD = 1.5$ radians.
An arc of the circle, centre $O$ and radius 10 cm, meets $OB$ at $A$ and $OD$ at $C$.

**(a)** Find the area of the shaded region.

*Answer*: ..... [3]

**(b)** Find the perimeter of the shaded region.

*Answer*: ..... [3]

**9** Find all the angles in

$$2\cos x = \sec x \qquad \text{for } 0° \leq x \leq 360°.$$

*Answer*: ..... [5]

**10** Prove: $\sec x - \frac{\cos x}{1+\sin x} = \tan x$ [4]

**11** A curve has the equation $y = \frac{3x+15}{x+1}$ where $x \neq -1$.

**(a)** Find $\frac{dy}{dx}$, in simplest form.

*Answer*: …… [3]

**(b)** Find the equation of the **normal** to the curve at the point where the curve meets the $x$-axis.

*Answer*: …… [4]

**12** **By differentiation**, find the coordinates of the **stationary points** of $y = x^3 - 3x^2 + 3$. Hence, determine the nature of these stationary points using appropriate methods or explanation.

*Answer*: ……...…..…… [8]

**13**

**(a)** $F$ is the point $(5, -2)$ and $\overrightarrow{FG} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$.

**(i)** Find the coordinates of $G$.

*Answer*: ( ……. , ……. ) [1]

**(ii)** Find the unit vector of $|\overrightarrow{FG}|$ .

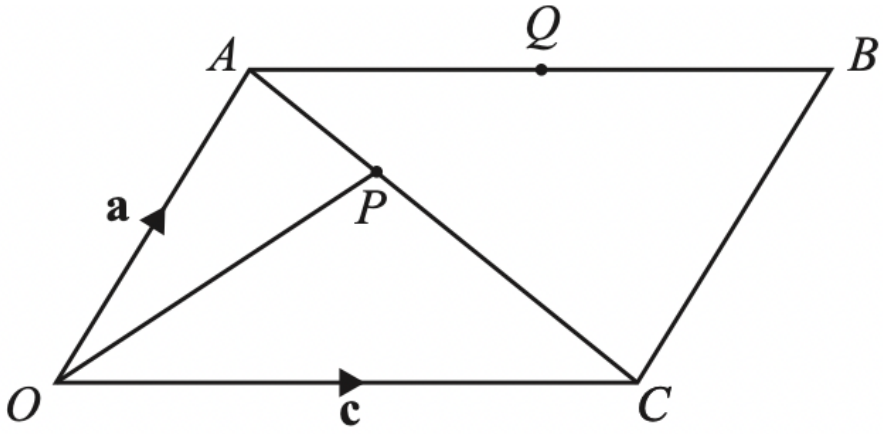
*Answer*: …… [3]

**(b)** It is given that $\mathbf{a} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$, $\mathbf{b} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix} 21 \\ 2 \end{pmatrix}$.

Find the value of $\lambda$ and $\mu$ if $\lambda\mathbf{a} + \mu\mathbf{b} = \mathbf{c}$.

*Answer*: …… [3]

**14**




$OABC$ is a parallelogram. $P$ is a point on $AC$ such that $AP : PC = 2 : 3$.
$Q$ is the midpoint of $AB$. $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OC} = \mathbf{c}$ .

Find in simplest terms of **a** and/or **c**.

**(a)** $\overrightarrow{QC}$

*Answer*: ..... [1]

**(c)** $\overrightarrow{OP}$

*Answer*: ..... [2]

**** E N D  OF  E X A M I N A T I O N ****