



**ST PIUS X COLLEGE
CHATSWOOD**

2022 HSC Task #2

Weighting 30%

7 April 2022

Extension 1 Mathematics

General Instructions

- Working time 45 minutes
- Write using blue or black pen
- Show all relevant mathematical reasoning and calculations
- NESA approved calculators may be used

Total marks – 30

- Attempt sections I and II
- Section I 5 marks
- Section II 25 marks
- Section I use the multiple choice answer sheet (attached)
- Section II answer Question 7 and 8 in a separate booklet

Student Number	
Teacher's name	
Multiple Choice	/5
Question 6	/12
Question 7	/13
Total	/30

Section I – 5 Marks MULTIPLE CHOICE one mark per question.

Answer this section on the multiple choice sheet at the back of this exam.

- 1 The vectors $\underline{u}, \underline{v}$ and \underline{w} are written in column form $\begin{bmatrix} -3 \\ 4 \end{bmatrix}, \begin{bmatrix} 12 \\ 5 \end{bmatrix}$ and $\begin{bmatrix} 8 \\ -15 \end{bmatrix}$.

What is the magnitude of the resultant?

- A $\sqrt{325}$ B $\sqrt{1225}$ C $\sqrt{353}$ D can't be found

- 2 Evaluate $\int_0^{\frac{\pi}{3}} -\cos x dx$.

- A $\frac{-\sqrt{3}}{2}$ B $-\frac{1}{2}$ C $\frac{1}{2}$ D $\frac{\sqrt{3}}{2}$

- 3 Which of the following vectors is not parallel to $3\underline{i} - 5\underline{j}$.

- A $6\underline{i} - 10\underline{j}$ B $9\underline{i} + 15\underline{j}$ C $-6\underline{i} + 10\underline{j}$ D $-3\underline{i} + 5\underline{j}$

- 4 For what values of x is the curve $y = \log_e(2 - x)$ undefined?

- A $x \leq 2$ B $x \leq -2$ C $x < -2$ D $x \geq 2$

- 5 Solve for: $\frac{27^{x-3} \times 9^{x-5}}{3^{2x+3}} = 243$

- A $x = 3$ B $x = 6$ C $x = 9$ D $x = 12$

Section II Question 6**12 marks****Answer question 7 in a separate booklet**

- a) i) Use the quotient rule or function of a function rule to find $\frac{d}{dx} \sec x$.

1

- ii) Hence evaluate $\int_{\pi/3}^{\pi/6} \sec x \tan x dx$.

2

- b) i) Given that $\sin^2 x + \cos^2 x = 1$ complete the identity $\tan^2 x + 1 = ?$

1

- ii) Find the value of $\int_0^{\pi/4} \tan^2 x dx$.

2

- c) The vectors \underline{u} and \underline{y} have column representation $\begin{bmatrix} 3 \\ 4 \end{bmatrix}$ and $\begin{bmatrix} -8 \\ 5 \end{bmatrix}$.

- i) Calculate $|\underline{u}|$ and $|\underline{y}|$.

1

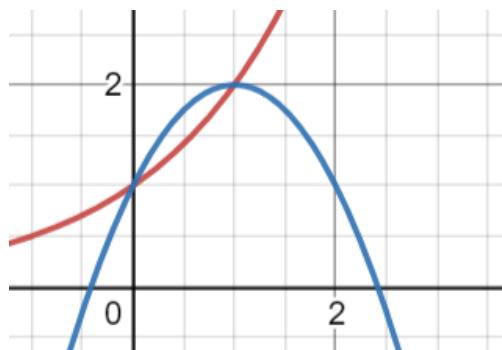
- ii) Calculate $\underline{u} \cdot \underline{y}$ and find the angle between the 2 vectors to the nearest degree.

2

- d) The graph shows the curves $y = 2^x$ and $y = 1 + 2x - x^2$.

3

Find the exact area between the two curves.



Section II continued Question 7**13 marks****Answer Q7 in a separate booklet**

- a) i) Show that the tangent to $y = \log_e x$ at point P, where $x = e$ passes through the origin. 2
- ii) The normal at P intersects the x axis at M.
Find the x intercept of M and the area of the triangle OPM. in simplest exact form. 2
- b) OPRQ is a rhombus. The position vector \overrightarrow{OP} is $8\hat{i} + 6\hat{j}$ while \overrightarrow{OQ} has position vector $10\hat{i}$
i) Find the component form of $\overrightarrow{OR} = \overrightarrow{OP} + \overrightarrow{OQ}$. 1
ii) Find \overrightarrow{PQ} in component form. 1
iii) Calculate $\overrightarrow{PQ} \cdot \overrightarrow{OR}$ and explain what geometrical feature is shown by this calculation. 1
- c) Find $\text{proj}_{\gamma}\vec{u}$ where $\vec{u} = \begin{bmatrix} 8 \\ 3 \end{bmatrix}$ and $\gamma = \begin{bmatrix} -3 \\ 4 \end{bmatrix}$. 2
- d) i) Draw a half page sketch of the graph of $y = \sin 2x$ for $\frac{-\pi}{2} \leq x \leq \frac{\pi}{2}$ showing intersections with the axes and turning points. 2
ii) The line $y = mx$ intersects 3 times with $y = \sin 2x$ for $\frac{-\pi}{4} \leq x \leq \frac{\pi}{4}$. 2
What are the constraints on m ?

End of assessment

Multiple Choice Answer Sheet

Student Number	
Teacher's name	

Colour your Choice for each section

1 A B C D

2 A B C D

3 A B C D

4 A B C D

5 A B C D