

Supervision Instructions

Mathematics Methods (Unit 1-2)

Task #5

23rd August 2022

Task consists of two papers: **Paper 1** and **Paper 2**. Students will have access to only one paper at a time.

Paper 1:

- 15 minutes
- Calculator is not allowed

After 15 minutes **Paper 1** is to be collected and **Paper 2** will be given.

Paper 2:

- 25 minutes
- Calculator is allowed

After 25 minutes **Paper 2** is to be collected.

Check that students put their names.



2022 Mathematical Methods (Unit 1-2)

Task 5

Paper 1 – Calculator not allowed

Number of marks: 10

Writing time: 15 minutes

Name:

Marks:

Instructions

Answer **all** questions in the spaces provided.

In all questions where a numerical answer is required, an exact value must be given unless otherwise specified.

In questions where more than one mark is available, appropriate working **must** be shown.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

2 marks

Solve $2\sin(2\theta) = -\sqrt{3}$ for $0 \leq \theta \leq \pi$.

Question 2

2 marks

Write down a sequence of transformations that takes the graph of $y = \sin(x)$ to the graph of

$$y = -4\sin\left(3x + \frac{\pi}{6}\right).$$

Question 3

2 marks

The graph of $y = a \tan(nx)$ has the domain $\left(-\frac{\pi}{3}, \frac{\pi}{3}\right)$ with vertical asymptotes at $x = -\frac{\pi}{3}$ and $x = \frac{\pi}{3}$ only. The graph passes through the origin and the point $\left(-\frac{\pi}{6}, -\frac{1}{2}\right)$. Determine its equation.

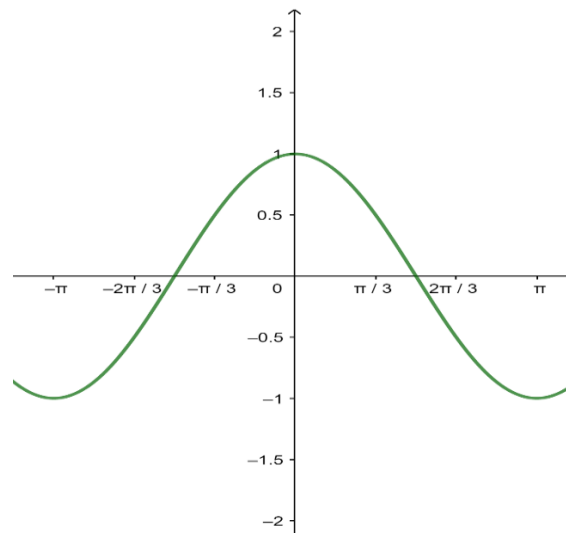
Question 4

2 marks

a. Solve $\cos\left(x + \frac{\pi}{3}\right) = 0$ for $x \in [-\pi, \pi]$

b. The function $g(x) = \cos(x)$ is shown on the axes below.

2 marks



Let $f : [-\pi, \pi] \rightarrow \mathbb{R}$, $f(x) = \cos\left(x + \frac{\pi}{3}\right)$.

Sketch the graph of the function f on the same set of axes above. Label y-intercept and turning points with their coordinates. Label endpoints of the graph with their coordinates.



2022 *Mathematical Methods* (Unit 1-2)

Task 5

Paper 2 – Calculator allowed

Number of marks: 15

Writing time: 25 minutes

Name:

Marks – Section 1:

Section 2:

SECTION 1

Instructions for Section 1

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

Given that $\sin(\theta) = 0.465$ and θ is in the first quadrant, which of the following is **not** true?

A $\sin(5\pi + \theta) = -0.465$

B $\sin(4\pi - \theta) = 0.465$

C $\sin(\pi + \theta) = -0.465$

D $\sin(-\theta) = -0.465$

E $\sin(3\pi - \theta) = 0.465$

Question 2

The number of solutions of the equation $\sqrt{2} \sin(3x) = -1$, $-\pi \leq x \leq \pi$ is

A 2

B 3

C 4

D 5

E 6

Question 3

The graph is most likely to be the graph of

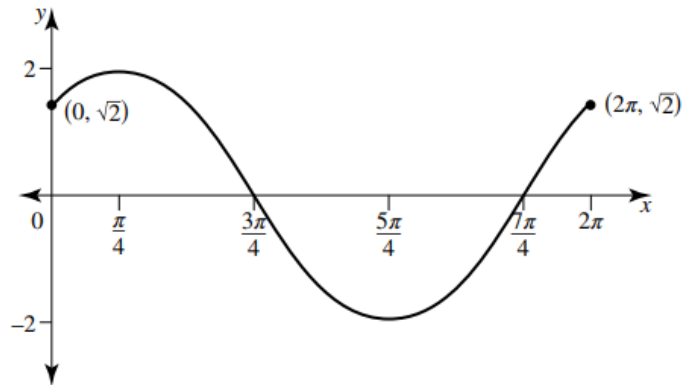
A $y = 2 \sin(x + \frac{\pi}{3})$

B $y = 2 \sin(x + \frac{\pi}{4})$

C $y = 2 \sin(x + \frac{\pi}{4}) + \sqrt{2}$

D $y = 2 \sin(x) + \sqrt{2}$

E $y = 2 \cos(x + \frac{\pi}{4})$



Question 4

If $\cos(a) = -\frac{4}{5}$ and $\pi \leq a \leq \frac{3\pi}{2}$, the **exact** value for $\sin(a)$ is

A $\frac{4}{5}$

B $\frac{3}{4}$

C $-\frac{3}{4}$

D $\frac{3}{5}$

E $-\frac{3}{5}$

Question 5

Sum of the solutions to the equation $2 \cos(2\theta) = -\sqrt{2}$, $0 \leq x \leq \pi$ is

A $\frac{5\pi}{8}$

B $\frac{3\pi}{8}$

C π

D $\frac{\pi}{2}$

E $\frac{\pi}{4}$

SECTION 2

Instructions for Section 2

Answer **all** questions in the spaces provided.

In all questions where a numerical answer is required, an exact value must be given unless otherwise specified.

In questions where more than one mark is available, appropriate working **must** be shown.

Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

Ms G is in a boat out at sea fishing. The weather makes a change for the worse and the water becomes very choppy. The depth of water above the seabed can be modelled by the function with equation

$$d(t) = 1.5 \sin\left(\frac{\pi t}{12}\right) + 12.5$$

Where d is the depth of water in metres and t is the time in hours since the change of weather began at 5 am.

a. How far from the seabed was the boat when the change of weather began? 1 mark

b. What is the period of the function? 1 mark

c. What are the maximum and minimum heights of the boat above the seabed and the times when these occurs? 2 marks

d. What is the depth of water above the seabed, correct to two decimal places, at 11:30 am?

1 mark

e. Ms G is interested in when the depth of water above the seabed is 13 meters at least. For how long, in minutes, this occurs?

2 marks

f. Sketch one cycle of the graph of the function $d(t)$. Label maximum, minimum and endpoints of the graph with their coordinates.

3 marks

