

Supervision Instructions

Mathematics Methods (Unit 1-2)

Task #2

March 2022 – Period 4

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 #2

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 for x where $x \in R$.

$$\sqrt[3]{x^2} + \sqrt[3]{x} - 2 = 0$$

Question 2

3 marks

For what values of k there will be at least one intersection point between the line $y = x - 3$

and the parabola $y = x^2 - kx - 2$.

Question 3

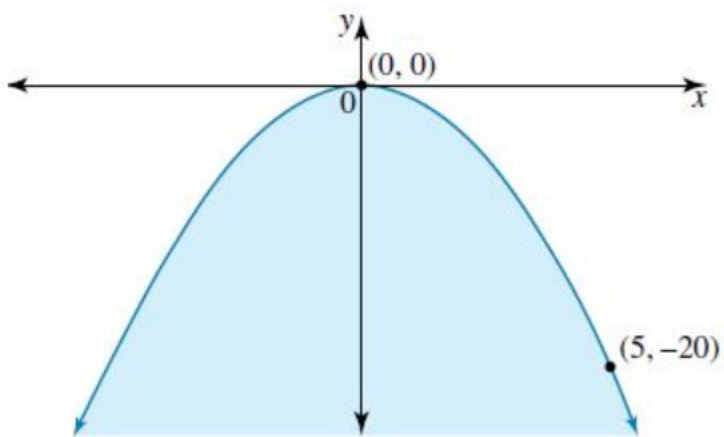
3 marks

Determine the x -intercepts of the cubic graph $x^3 + 4x^2 - 7x - 10$.

Question 4

2 marks

Determine the rule for the region shaded in the diagram below.





2022 Mathematical Methods (Unit 1-2)

Task #2

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

The parabola $y = x^2 + 5$ is translated horizontally 3 units to the left and 4 units downwards. The resulting graph has equation:

A $y = (x - 3)^2 + 9$

B $y = (x + 3)^2 - 4$

C $y = (x + 3)^2 + 1$

D $y = (x - 3)^2 - 1$

E $y = (x - 3)^2 + 1$

Question 2

Select the **correct** statement about the polynomial $P(x) = a\sqrt[n]{x^m} + bx^2 + c$.

A $m, b, c \in \mathbb{Z}$

B $n \in \mathbb{Q}$

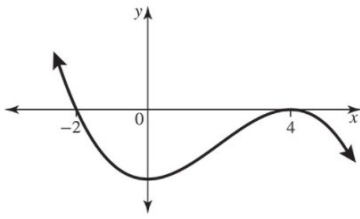
C $n, m, c \in \mathbb{Q}^+$

D $m = nk, k \in \mathbb{Z}^+$

E $a, b, c \in \mathbb{Z}^+$

Question 3

The equation of the graph shown, where a is a positive constant, could be:



- A $y = a(x+2)(x-4)^2$
- B $y = a(x+2)^2(x-4)$
- C $y = a(x+4)^2(x-2)$
- D $y = -a(x+4)(x-2)^2$
- E $y = -a(x+2)(x-4)^2$

Question 4

Given that the points $(-1, -3)$, $(2, 21)$ and $(3, 37)$ lie on a parabola with equation $y = ax^2 + bx + c$. Find the values of a , b and c .

- A $a = 2, b = 6, c = 1$
- B $a = -2, b = 6, c = 3$
- C $a = -1, b = 3, c = -4$
- D $a = 4, b = -2, c = 1$
- E $a = 6, b = -2, c = 3$

Question 5

If $P(-3) = 0$, then

- A -3 is the remainder when $P(x)$ is divided by $(x+3)$.
- B $(x+3)$ is a factor of $P(x)$
- C $(x-3)$ is a factor of $P(x)$
- D 3 is the remainder when $P(x)$ is divided by $(x+3)$
- E $(x+3)$ is the quotient when $P(x)$ is divided by $(x-3)$

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.

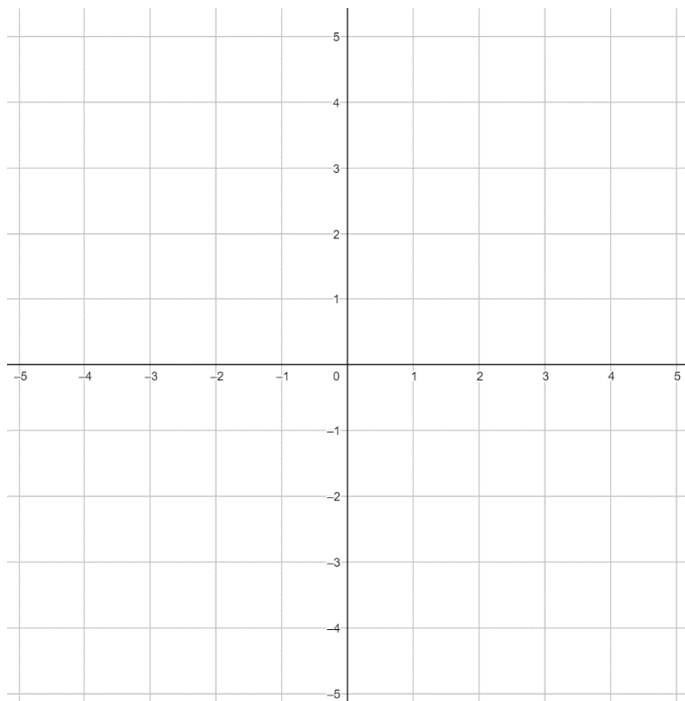
Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

Consider $P(x) = 3x^3 + kx^2 + 4$. Given that $(3x + 2)$ is a factor of $P(x)$.

a. Find k and hence express $P(x)$ as a product of linear factors. 2 marks

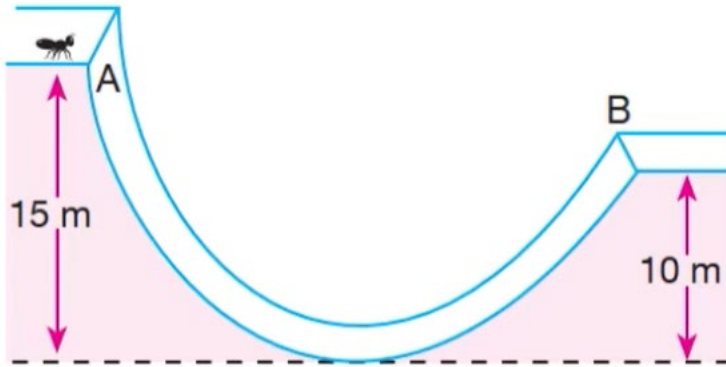
b. Sketch the graph of $P(x)$. 1 mark



Question 2

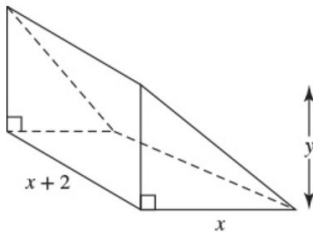
3 marks

An ant is moving from point A to point B in a parabolic path as shown in the diagram below. The height of the ant is modelled by $h(t) = t^2 - 6t + p - 2$ meters for t minutes. How long, in minutes, will it take for ant to reach to the point B?



Question 3

The triangular box below consists of sides x mm in length and $x + 2$ mm in width and a height of y mm. The length, width, and height added together equal 24 mm.



- a. Find the volume, V , of the box in terms of x .

2 marks

(The formula of volume is $V = \text{Area of the base} \times \text{Length of the prism}$)

- b. Find the possible values of x .

2 marks