Supervision Instructions

Mathematics Methods (Unit 1-2)
Task #1
28th of February 2023 – 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.

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Name: Marks:

Question 1   2 marks

Solve for x where $x \in R \setminus \{1, 0\}$.

$$\frac{3}{2(x-1)} - \frac{1}{x} = \frac{1}{3x}$$

Question 2   2 marks

Simplify

$$\frac{a^2 - 9b^2}{(a-3b)^2} \div \frac{(a+3b)^2}{4a-12b}$$

Question 3   2 marks

Find the equation of the line, which passes through the point $(1, -\dfrac{1}{5})$, and is perpendicular to

the line $2y - 5x + 8 = 0$.

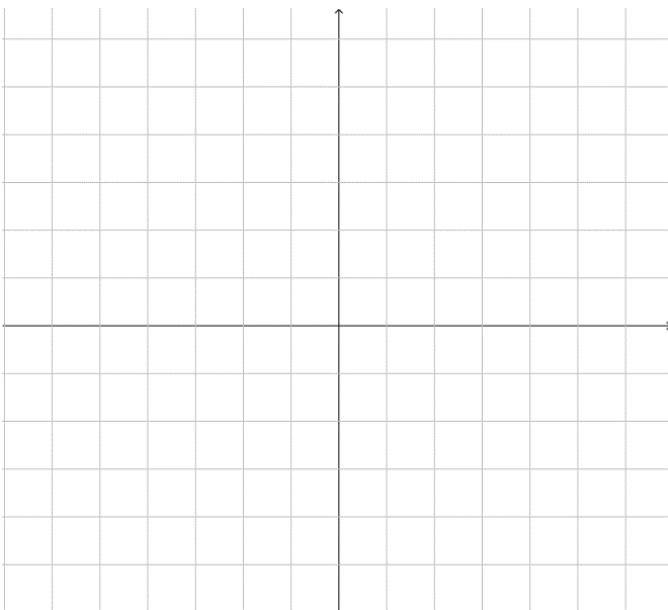## Question 4   2 marks

Solve for x.

$$\frac{9\sqrt{x} - 7}{3\sqrt{x}} = \frac{3\sqrt{x} + 1}{\sqrt{x} + 5}$$

Question 5   2 marks

On the Cartesian plane below, sketch the region described by $4x - \dfrac{2y}{3} \leq 2$.

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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 simultaneous linear equations

$(1-t)x - ty = -1$

$3x - 2y = 4$

where t is a real constant, has no solution provided

A $t \in \left\{ \dfrac{5}{2} \right\}$

B $t \in R \setminus \left[\dfrac{2}{5} \right]$

C $t = 0$

D $t \in R \setminus \left\{ \dfrac{5}{2} \right\}$

E $t \in \left\{ \dfrac{2}{5} \right\}$

Question 2

The set of numbers $R^+ \setminus [1,5)$ can be described as:

A $\{x : 1 \leq x < 5\}$

B $\{1, 2, 3, 4\}$

C $(0,1) \cup [5, \infty)$

D $(-\infty, 1) \cup [5, \infty)$

E $\{x : 0 < x \leq 1\} \cup \{x : x \geq 5\}$

Question 3

The equation of the line which passes through the point $(4, \sqrt{3})$, makes an angle of $45°$ with the positive direction of the x-axis.

A $\quad y = 4x - \sqrt{3}$

B $\quad y = x + 4 - \sqrt{3}$

C $\quad y = x - 4 + \sqrt{3}$

D $\quad y = -x - 4 + \sqrt{3}$

E $\quad y = 4x + \sqrt{3}$

Question 4

The algorithm shown on the right will print the value.

A   14

B   18

C   24

D   28

E   32

```
Integer a, b, c
Set a = 8, b = 6, c = 4
If (a > b)
   a = a + b
Else
   b = b - a
End If
If (c > b)
   c = c - b
Else
   b = c + b
End If
Print a + b + c
```

Question 5

For what values of x, $\dfrac{x^2 - 9}{(x^2 - 4)(x^3 - 16x)}$ is undefined?

A $x = 0, \pm 2, \pm 3, \pm 4$

B $x = 0, \pm 2, \pm 4$

C $x = \pm 2, \pm 4$

D $x = 0, +2, +4$

E $x = \pm 3$

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

A damaged plane is flying at a height of 5000 m and is losing altitude at rate of 80 m per minute.

a. Write a linear equation to model this situation in term of height (h) in meters and time (t) in minutes.   1 mark

b. If the plane is 1.5 hours from the nearest airport, can the plane make it to the airport before it needs to make a crash landing?   1 mark

c. What is the maximum time to the nearest minute the plane can stay in the air?   1 mark

Question 2   2 marks

Show that $\left(\dfrac{1}{1+\dfrac{2}{a+1}} \right)\left(\dfrac{a^2+4a-1}{a+1} - 2 \right) = a-1$

Question 3

Let K be a point on the straight line $y = 3x - 2$ such that the length of OK, the line segment from the origin, is a minimum.

a.   Find the equation of OK.   2 marks

b.   Find the coordinate of K.   2 marks

c.   Find the distance of OK.   1 mark