Semester 1 (Unit 3) Examination, 2018

Question/Answer Booklet

MATHEMATICS METHODS

Section One: Calculator-free

Student Name/Number: _____

Teacher Name: _____

Time allowed for this section

Reading time before commencing work: five minutes

Working time for this section: fifty minutes

Materials required/recommended for this section

To be provided by the supervisor: This Question/Answer Booklet
Formula Sheet

To be provided by the candidate:

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: nil

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of exam
Section One: Calculator-free	8	8	50	50	35
Section Two: Calculator-assumed	14	14	100	100	65
					100

Instructions to candidates

1. The rules for the conduct of School exams are detailed in the *School/College assessment policy*. Sitting this examination implies that you agree to abide by these rules.

2. Write your answers in this Question/Answer Booklet.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
   - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
   - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

5. **Show all working clearly.** Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat any question, ensure that you cancel the answer you do not wish to have marked.

6. It is recommended that you **do not use pencil**, except in diagrams.

7. The Formula Sheet is **not** to be handed in with your Question/Answer Booklet.

 See next page

Section One: Calculator-free **(50 Marks)**

This section has **(eight) 8** questions. Answer **all** questions. Write your answers in the spaces provided. Spare pages are included at the end of this booklet.

Suggested working time: **50 minutes**.

Question 1 **(7 marks)**

(a) Determine $\frac{d}{dx}(x\cos x)$. (2 marks)

(b) Differentiate $y=(x^3+4\sin x)^5$ with respect to x. (2 marks)

(c) Differentiate $y=\frac{e^{-2x}}{4x+2}$ with respect to x. (3 marks)

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Question 2 **(4 marks)**

Find the area bounded by the curve $y = \sin 3x$ and the x axis from $x = 0$ to $x = \frac{2\pi}{3}$.

Question 3 **(3 marks)**

Determine $f(x)$ given that $f'(x) = x + \sqrt{3+6x}$ and $f(1) = 10$.

 See next page

Question 4 **(10 marks)**

A random number generator produces whole number values for X in the range [1,1000]. Each X value is equally likely.

(a) Describe the probability distribution of X. (1 mark)

(b) Evaluate $P(250 \leq X \leq 550)$. (1 mark)

(c) Evaluate $P(X \text{ is divisible by } 7)$. (2 marks)

(d) Evaluate $P(X \text{ is divisible by } 10 \text{ or by } 25)$. (4 marks)

(e) Evaluate $P(X \text{ has exactly two } 3\text{'s in its decimal expansion})$. (2 marks)

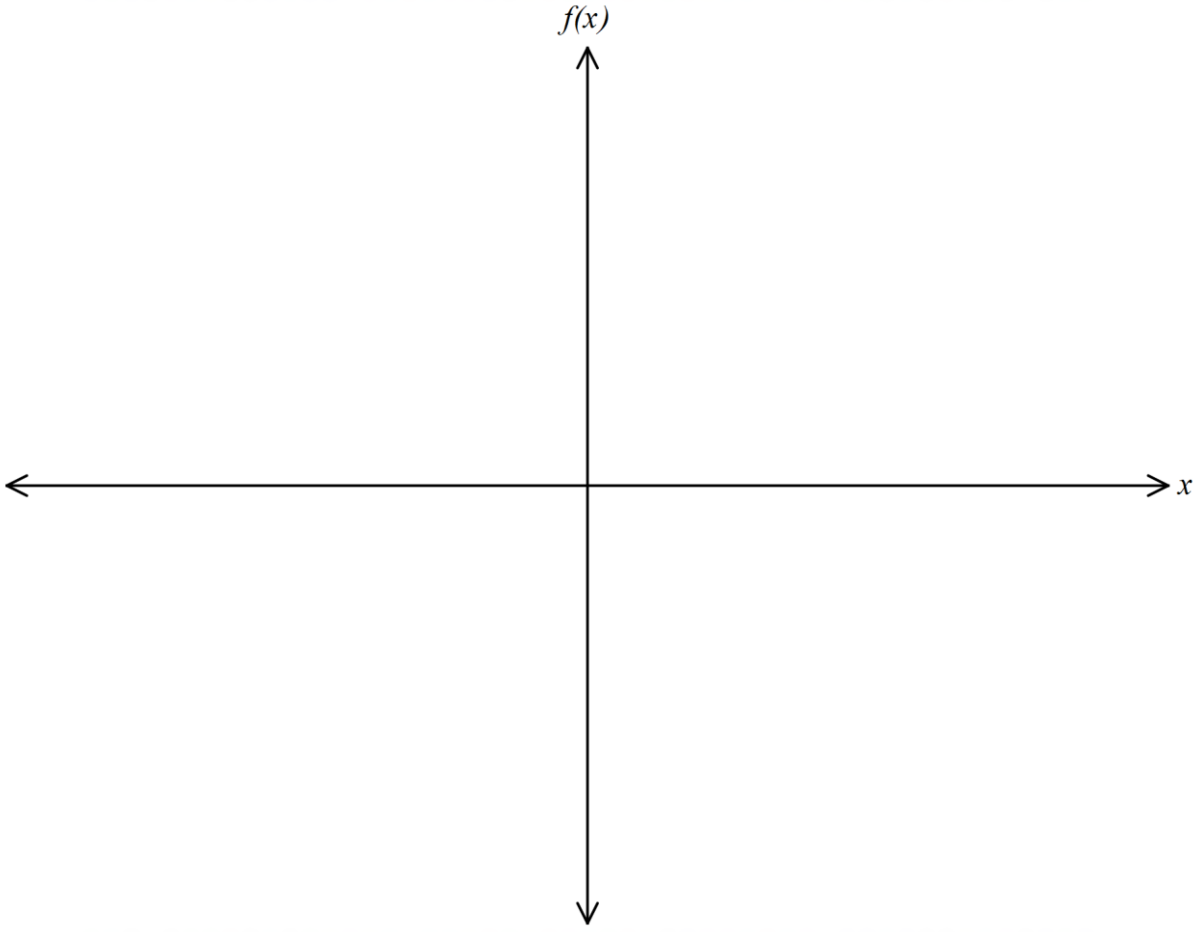
 See next page

Question 5 **(3 marks)**

The function $f(x)$ is defined as $f(x) = x^3 - 3x^2$.

Use the information provided in the table below to sketch $f(x)$.

x	-1	0	1	2	3
$f(x)$		0	-2	-4	0
$f'(x)$	9	0	-3	0	9
$f''(x)$			0		



Question 6 **(6 marks)**

Determine the following indefinite integrals.

(a) $\int \frac{1-2x}{x^3}\,dx$ (2 marks)

(b) $\int \sin\left(x-\frac{\pi}{4}\right)-\cos \pi x\,dx$ (2 marks)

(c) $\int \left(e^x-\frac{1}{e^x}\right)^2\,dx$ (2 marks)

Question 7 **(7 marks)**

The secant function, $\sec x$, is defined as the reciprocal of the cosine function.

ie $\sec x = \dfrac{1}{\cos x}$ $\cos x \neq 0$

For the secant function $y = \sec(\dfrac{\pi}{3} - x)$ determine

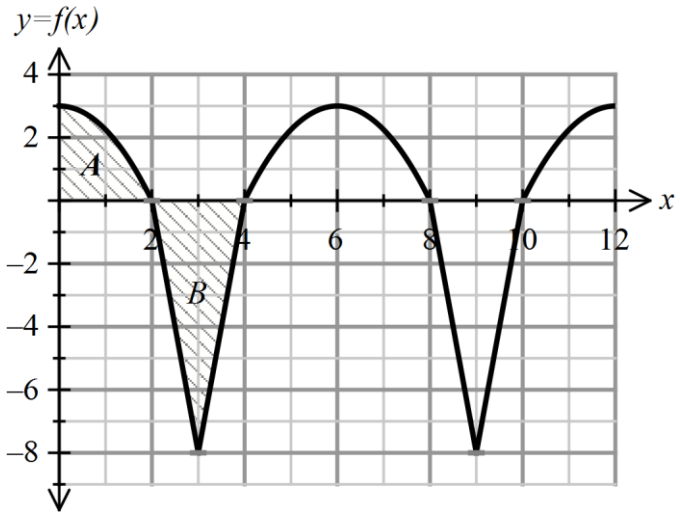
(a) $\dfrac{dy}{dx}$ (3 marks)

(b) the exact value of $\dfrac{dy}{dx}$ at $x = \dfrac{2\pi}{3}$. (4 marks)

Question 8 **(10 marks)**

Consider the graph $y = f(x)$ shown below for $0 \le x \le 12$. Each of the curved sections of $f(x)$ can be obtained by translating the appropriate part of the function $y = -0.75x^2 + 3$, $-2 \le x \le 2$.

A is the area of the shaded region bounded by the x axis, the y axis and $f(x)$. B is the area of the shaded triangle with vertices at (2,0), (3,-8) and (4,0).



Use the graph of $y = f(x)$ where appropriate to answer the following.

(a) Express the following in terms of A and B

(i) $\int_0^4 f(x)\ dx$ (1 mark)

$\int_0^4 2f(x)\ dx + \int_8^4 f(x)\ dx$

(ii) (3 marks)

(b) Determine $\int_6^8 f'(x)\ dx$. (2 marks)

(1 mark)

(c) Given that A = 4 square units

(i) determine the value/s of m, $0 \le m \le 12$ such that $\int_0^m f(x)\ dx = 0$. (2 marks)

(ii) evaluate $\int_0^4 g(x)\ dx$ where $g(x) = f(x) + 2$ for the domain $0 \le x \le 12$. (2 marks)

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Additional working space

Question number: _____

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