Student Name: _____

Methodist Ladies' College Semester 2, 2010

3CD MATHEMATICS

Question/Answer Booklet – Section 1 – Calculators *NOT* allowed – Notes sheets *NOT* allowed

Teacher's Name: _____

Time allowed for this paper

Section	Reading	Working
Calculator-free	5 minutes	50 minutes
Calculator-assumed	10 minutes	100 minutes

Materials required/recommended for this paper

Section One (Calculator-free): 40 marks

To be provided by the supervisor
Section One Question/Answer booklet Formula sheet

To be provided by the candidate
Standard items: pens, pencils, pencil sharpener, highlighter, eraser, ruler

Section Two (Calculator-assumed): 80 marks

To be provided by the supervisor
Section Two Question/Answer booklet Formula sheet

To be provided by the candidate
Standard items: pens, pencils, pencil sharpener, eraser, correction fluid, ruler, highlighters

Special items: drawing instruments, templates, notes on two unfolded sheets of A4 paper, and up to three calculators satisfying the conditions set by the Curriculum Council for this course.

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.

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Instructions to candidates

1. **All** questions should be attempted.

2. Write your answers in the spaces provided in this Question/Answer Booklet. Spare answer pages may be found at the end of this booklet. If you need to use them, indicate in the original answer space where the answer is continued (i.e. give the page number).

3. **Show all your 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. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.

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

Structure of this paper

Questions	Marks available	Your score
1	5	
2	5	
3	4	
4	4	
5	2	
6	4	
7	7	
8	4	
9	5	
Total:	**40**	
10	5	
11	3	
12	5	
13	8	
14	10	
15	7	
16	8	
17	6	
18	7	
19	5	
20	7	
21	6	
22	3	
Total:	**80**	
Total marks = 120		
		%

See next page

Section One: Calculator-free **(40 Marks)**

This section has **nine (9)** questions. Answer **all** questions. Write your answers in the space provided.

Suggested working time for this section is 50 minutes.

Question 1 **(5 marks)**

Solve $\dfrac{2x^2+13x+15}{x^2-9} \geq \dfrac{2x+1}{x+3}$

Question 2 **(5 marks)**

Find the following:

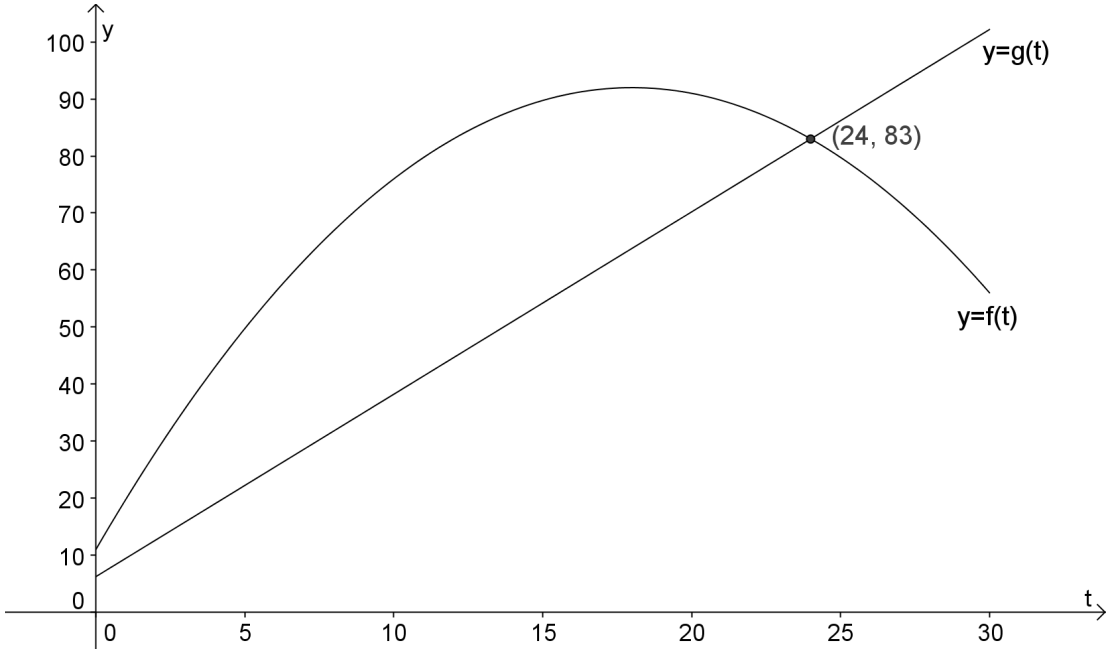
(a) $\int x^2\sqrt{x^3+5}\,dx$ [2]

(b) $\int_0^3 e^{-4x}\,dx$ [2]

(c) $\frac{d}{dx}\int_3^x \frac{8t}{\sqrt{t+9}}\,dt$ [1]

Question 3 **(4 marks)**

The graphs of $f(t) = -0.25t^2 + 9t + 11$ and $g(t) = 3.2t + 6.2$ are shown on the axes below.



(a) Write down an expression for the area enclosed by the two graphs and the vertical axis. [1]

(b) If $f(t)$ represents the marginal revenue (in hundreds of dollars) for a product, where t is measured in months and $g(t)$ represents the marginal cost (also in hundreds of dollars) for the product, what does this enclosed area represent? [2]

(c) Write down an expression for the volume of the solid generated when the part of the curve $y = f(t)$ between $t = 5$ and $t = 25$ is rotated about the horizontal axis. [1]

Question 4 **(4 marks)**

In a probability experiment, events A and B are such that

$$P(A)=\frac{1}{4},\ P(B|A)=\frac{1}{3} \text{ and } P(\overline{A}\cap\overline{B})=\frac{1}{4}.$$

Find

(a) $P(A \cup B)$ [2]

(b) $P(B)$ [2]

Question 5 **(2 marks)**

Which of the following statements is true for two events, each with probability greater than 0? Justify your answer.

A: If the events are mutually exclusive, they must be independent.

B: If the events are independent, they must be mutually exclusive.

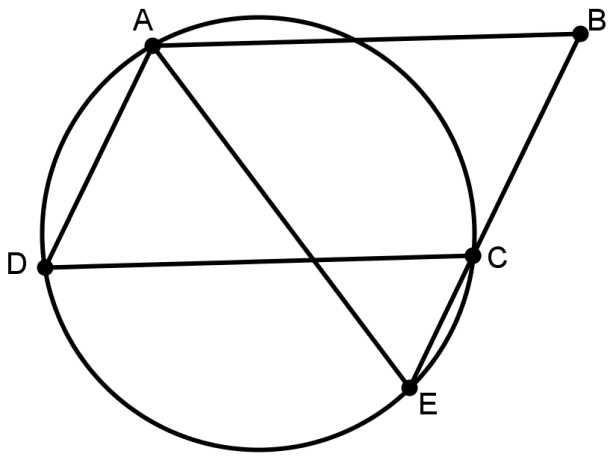
C: If the events are not mutually exclusive, they must be independent.

D: If the events are not independent, they must be mutually exclusive.

E: If the events are mutually exclusive, they cannot be independent.

Question 6 **(4 marks)**

In the diagram below, ABCD is a parallelogram.



Prove that ΔABE is isosceles.

Question 7 **(7 marks)**

Consider the following system of equations:

$$\begin{aligned} 3x-2y+z&=-7 \\ -x+2y+2z&=11 \\ ax+bz&=4 \end{aligned}$$

(a) Determine the value of a and of b such that the system of equations has an infinite number of solutions. [2]

(b) Solve the system when $a=-2$ and $b=1$. [5]

Question 8 **(4 marks)**

Given $f(x)=\sqrt{x}+2$, $g(x)=\frac{1}{x+5}$, and $k(x)=\frac{1}{x}-5$, determine:

(a) $g \circ f(1)$ [2]

(b) the domain and range of $k \circ f$ [2]

Question 9 **(5 marks)**

Determine the equation of the line tangential to the curve $f(x)=\frac{9-x^2}{x}$ at the point where $x=1$.

Additional working space

Question number(s):_____

Additional working space

Question number(s):_____

Additional working space

Question number(s):_____

Additional working space

Question number(s):_____

DO NOT WRITE IN THIS AREA