Revision Examination Assessment Papers (REAP)

Semester 1 Examination 2012

Question/Answer Booklet

(This paper is not to be released to take home before 25/6/2012)

MATHEMATICS 3C

Section One:
Calculator-free

Name of Student: _____

Time allowed for this section
Reading time before commencing work: 5 minutes
Working time for this section: 50 minutes

Materials required/recommended for this section
To be provided by the supervisor
This Question/Answer Booklet
Formula Sheet

To be provided by the student
Standard items: pens, pencils, pencil sharpener, eraser, correction fluid/tape, ruler, highlighters
Special items: nil

Important note to students
No other items may be used in this section of the examination. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Question 3 **(7 marks)**

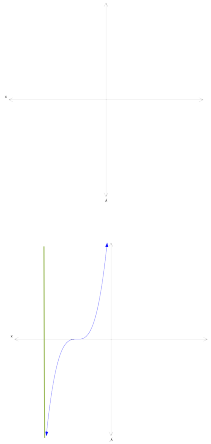
(a) It is claimed that the tangent to the curve $y = x^3 - 2x^2 - 4x + 3$ at the point where $x=1$ passes through the point (3,8). Is this claim valid? Justify your answer. (5)

(b) Two identical biased coins are tossed together, and the outcome is recorded. After a large number of trials it is observed that the probability that both coins land showing heads is 0.36.

What is the probability that both coins land showing tails? (2)

Question 2 (continued)

(c) Given the derivative function, sketch the graph of the function. (2)



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	6	6	50	50	
Section Two Calculator-assumed	12	12	100	100	
			Total	150	100

Instructions to students

1 Write your answers in the spaces provided in this Question/Answer Booklet. 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. 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(s) that you are continuing to answer at the top of the page.

2 **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 to receive full marks. If you repeat an answer to any question, ensure that you cancel the answer you do not wish to have marked.

Question 4 (8 marks)

The volume of a certain rectangular box is given by the equation $f(x) = x^3 - 5x^2 - 8x + 48$.

(i) If the height of the box is $(4 - x)$ units, determine an algebraic expression for the area of the base of the box. (3)

(ii) Calculate the value of x for which the volume is a maximum. (5)

Question 6 (continued)

(c) (ii) $\int_{-1}^{2}(4f(x)+3)\,dx$ (2)

(iii) Sketch a possible graph of $y=f(x)$ for $-3 \le x \le 6$. Your graph should display the relative areas of important regions but you do not need to draw this graph to scale. (1)

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

Question 5 **(10 marks)**

(a) A spherical balloon is being deflated in such a way that the volume is decreasing at a constant rate of $120\text{cm}^3/\text{sec}$. At time t (seconds), the radius of the balloon is r cm.

Find the rate of change of the surface area when the volume is $\frac{32}{3}\pi r^3\ \text{cm}^3$. (5)

Question 2 **(9 marks)**

(a) Differentiate the following with respect to x.

(i) $f(x)=\frac{-x}{x^2+1}$ (express in simplest form) (3)

(ii) $y(x)=(x+1)^2e^{x^2}$ (do not simplify) (2)

(b) Sketch the graph of the derivative function for on the axes below. (2)

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

This section has **six (6)** questions. Answer all questions. Write your answers in the spaces provided.

Working time: 50 minutes

Question 1 **(8 marks)**

(a) Solve the inequality $\frac{x+1}{x^2+2x-3} \geq 0$ (4)

(b) The functions $f(x)$ and $g(x)$ are defined as follows

$f(x) = x^2 - 4$ and $g(x) = \sqrt{x-5}$

(i) Determine expressions for $f[g(x)]$ and $g[f(x)]$. (2)

(ii) Determine the range of $f[g(x)]$. (1)

Question 6 **(8 marks)**

(a) Determine $\int (1+3x^2)^2 dx$ (2)

(b) Determine $\int 3x^3(2x^4-5)^6 dx$ (2)

(c) $f(x)$ is defined such that $\int_3^8 f(x)\,dx = 24$ and $\int_2^8 f(x)\,dx = 36$

Find

(i) $\int_3^2 f(x)dx$. (1)

(iii) Determine the domain of $g[f(x)]$. (1)

Question 5 (continued)

(b) Events A and B are such that $P(A) = \frac{1}{2}$, $P(B) = \frac{7}{12}$ and $P(A \cup B) = \frac{1}{4}$

(i) Show that event A and B are **NOT** mutually exclusive. (3)

(ii) Hence find $P(A \cap B)$. (2)