



**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.

### 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 6 (continued)

(c) (iii)  $\int_2^{-3} (4f(x) + 3) \, dx$

(2)

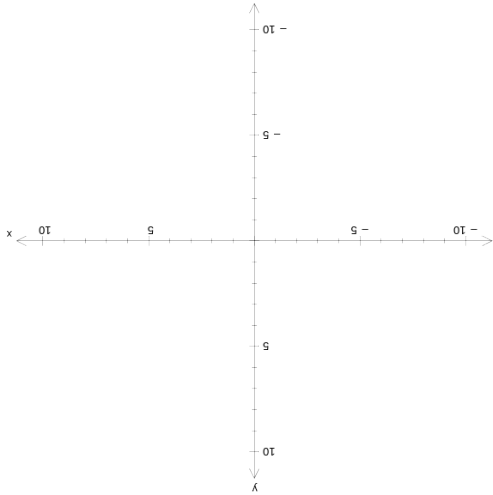
3

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

(!!!!)

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

(1)



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

**(50**

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

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

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

(2)

(b) Determine  $\int 3x^3(2x^4 - 5)^8 dx$

(2)

(c)  $f(x)$  is defined such that  $\int_3^6 f(x) dx = 24$  and  $\int_2^6 f(x) dx = 36$

Find

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

(1)

Question 5 (continued)

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

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

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

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

(1)

**Question 2**

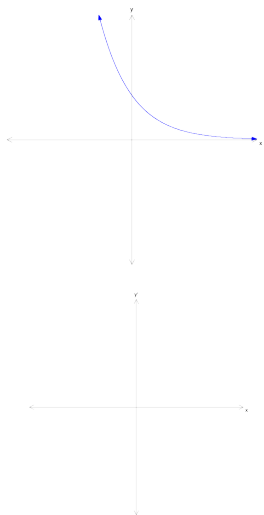
**(9 marks)**

- (a) Differentiate the following with respect to  $x$ .

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

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

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



**Question 5**  
**marks)**

**(10**

- (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  $36\pi^4\text{cm}^3$ . (5)

**Question 4** (8 marks)

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

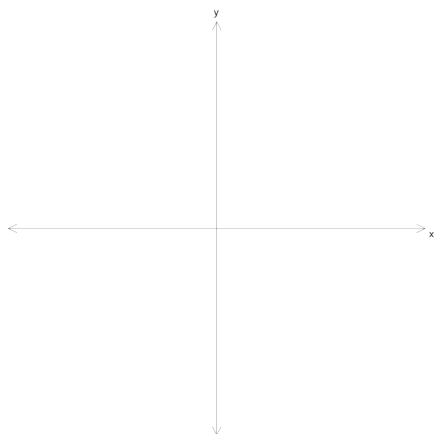
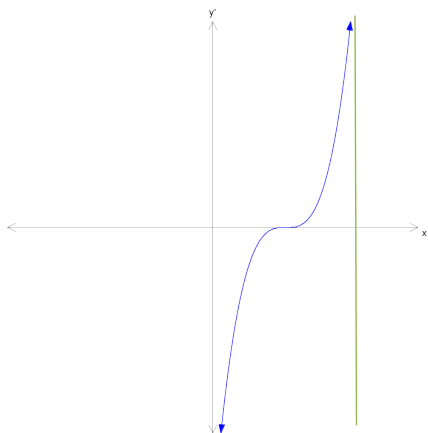
- (i) If the height of the box is  $(4 - x)$  units, determine an algebraic expression for the area of the base of the box. (3)

- (iii) Calculate the value of  $x$  for which the volume is a maximum. (5)

**Question 2 (continued)**

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

(2)



**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)