



Christ Church  
Grammar School

2015  
UNIT TEST 2

## Year 12 MATHEMATICS 3CD

### Section One: Calculator-free

Student name \_\_\_\_\_

Teacher name \_\_\_\_\_

#### **Time and marks available for this section**

Reading time before commencing work: 2 minutes  
Working time for this section: 15 minutes  
Marks available: 15 marks

#### **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.

**Instructions to candidates**

1. Write your answers in this Question/Answer Booklet.
2. Answer all questions.
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 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.
4. It is recommended that **you do not use pencil**, except in diagrams.

## Question 1

(4 marks)

The radius, in centimetres, of a circular ripple  $t$  seconds after it first appears is given by

$$r = \frac{2 + 3t}{4 + t}$$

- (a) Find the rate at which the radius is increasing when  $t = 1$ . (2 marks)

- (b) Use the formula  $\delta r \approx \frac{dr}{dt} \delta t$  to approximate the increase in the radius of the ripple between  $t = 1$  and  $t = 1.05$  seconds. (2 marks)

**Question 2****(4 marks)**

Evaluate the following integrals.

(a)  $\int (2x - e)^2 dx$

(2 marks)

(b)  $\int x^2 e^{x^3} dx$

(2 marks)

Question 3

(3 marks)

The diagram below shows the graphs of  $y = f(x)$  and  $y = g(x)$  intersecting at  $x = m, n$  and  $p$ . The area of the regions A, B, C, D, E and F are as follow.

Area A = 14 units;

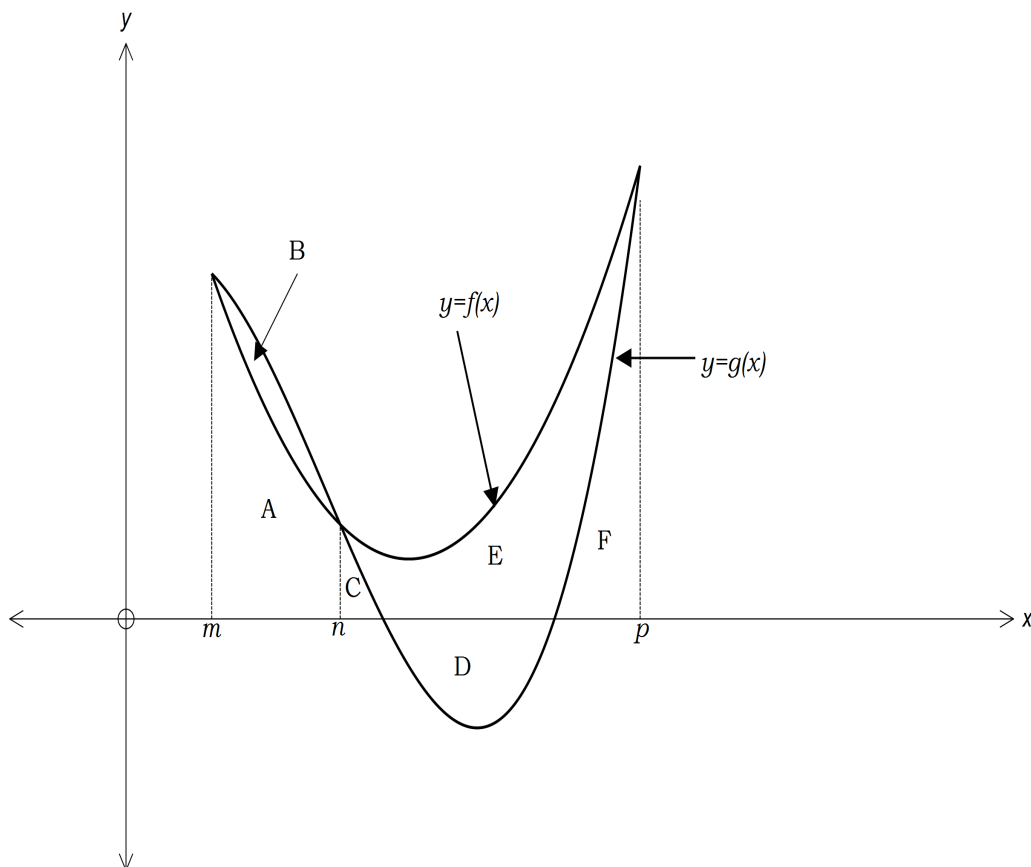
Area B = 2 units

Area C = 1 unit;

Area D = 7 units

Area E = 17 units;

Area F = 9 units



Determine the value of the following integrals.

(a)  $\int_m^n f(x) - g(x) dx$  (1 mark)

(b)  $\int_n^p f(x) + g(x) dx$  (2 marks)

**Question 4****(4 marks)**

In a box of six identical iPhones, it is known that two are faulty and the other four operate perfectly.

Four iPhones are removed at random from the box.

(a) Determine the probability that

(i) three of them operate perfectly.

(1 mark)

(ii) no more than two of them operate perfectly.

(1 mark)

(b) The first iPhone removed is faulty, the second operates perfectly, but the condition of the last two removed is not known. Determine the probability that three out of the four iPhones removed from the box operate perfectly. (2 marks)

**End of questions**