



Prifysgol Cymru
Y Drindod Dewi Sant
University of Wales
Trinity Saint David

Complete, fold and seal

(see note 2 below)

SURNAME: BENDALL

FORENAME(S): CHRISTOPHER

PAUL

Examination Answer Books

12 Pages

Instructions to Candidates

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	2015846 155 846
2	Title of Examination Paper	TCA 2
3	Module Code	PCEE4000/PCPo 4000
4	Date and Time of Examination	19-05-21 1400
5	Examination Venue	Pembrokeshire College
6	Seat Number	
7	Number of Answer Books handed in	

List the numbers of the questions you have attempted	Office Use
6	5
7	8
1	16
2	1
4	13
5	8
3	6
Office Use	57 ✓

Second Marker
SDP
25/05/21

(6)

T	x	F	Fx	$\sum F(x - \bar{x})^2$
	1	3	3	$60 \cdot 3 (1 - 4.76)^2 = 848.256$
	3	19	57	$60 \cdot 19 (3 - 4.76)^2 = 185.856$
	5	24	120	$60 \cdot 24 (5 - 4.76)^2 = 3.456$
	7	10	70	$60 \cdot 10 (7 - 4.76)^2 = 301.056$
	9	4	36	$60 \cdot 4 (9 - 4.76)^2 = 1078.656$
		$\sum 60$	$\sum 286$	$\sum 2417.28$

$$\bar{x} = \sum Fx / \sum F = 286 / 60 = 4.76 \quad \text{randomly} = \text{mean.}$$

$$s.d = \sqrt{\frac{2417.28}{60}} = 6.3473$$

$$\text{mean} = \sum Fx / F$$

(7)

$$A = 0.77 \quad B = 0.81$$

$$a) \text{ series} = 0.77 \times 0.81 = 0.6237$$

$$b) \text{ Parallel} = 1 - 0.77 = 0.23$$

$$1 - 0.81 = 0.19$$

$$0.19 \times 0.23 = 0.0437$$

$$\therefore 1 - 0.0437 = 0.9563$$

(8)

1. a) $y = \frac{1}{3}x^4 - 2x^5 - \sqrt{x} \quad ax^n.$
 $= \frac{1x^{-4}}{3} - 2x^5 - 1x^{1/2} \quad nax^{n-1}$

$$\frac{dy}{dx} = \left(\frac{-4 \times 1x^{-4-1}}{3} \right) + (5x - 2x^{5-1}) + \left(\frac{1}{2}x - 1x^{1/2-1} \right)$$

$$= \frac{-4x^{-5}}{3} - 10x^4 - \frac{1}{2}x^{-1/2}$$

$$= \frac{-4}{3x^5} - 10x^4 - \frac{1}{2\sqrt{x}}$$

4 ✓

b) $y = \frac{5 \cos 2x}{x^4}$

~~product. X Quotient~~

~~$u = 5 \cos 2x \quad v = 1x^4$~~

~~$\frac{dv}{dx} = 1x^4$
 $= 4 \times 1x^{4-1}$
 $= 4x^3$~~

~~$u \frac{dv}{dx} + v \frac{du}{dx}$~~

~~$\frac{du}{dx} = 5 \cos(2x)$
 $= 2 \times 5 \sin(2x)$
 $= 10 \sin 2x$~~

WRONG WILL
RE-DO.

~~$\therefore 5 \cos 2x \times 4x^3 + 1x^4 \times 10 \sin 2x$
 $= 20x^3 \cos 2x + 10x^4 \sin 2x$~~

c) ~~1.111~~ $y = 2 \cos(4x^2)$

Actual product.

$u = 2 \cos 0x \quad v = 4x^2$

$\frac{dv}{dx} = 4x^2$
 $= 8x^1$
 $= 8x. \checkmark$

$u \frac{dv}{dx} + v \frac{du}{dx}$

$\frac{du}{dx} = 2 \cos(0x)$
 $= 1 \times 2 \sin(1x)$
 $= -2 \sin 1x$
 $= -2 \sin. \checkmark$

$$\therefore 2 \cos x \cdot 8x + 4x^2 \times -2 \sin x$$

$$= 16x \cos x + -8x^2 \sin x$$

X

(2) ✓

b) Attempt no.2 - used wrong rule.

$$y = \frac{5 \cos 2x}{x^4}$$

quotient

$$u = 5 \cos 2x$$

$$v = 1x^4$$

$$du/dx = 5 \cos 2x$$

$$= -10 \sin 2x$$

$$\text{Rule} = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$$

$$dv/dx = 1x^4$$

$$= 4x^3$$

$$\therefore \frac{1x^4 \{-10 \sin 2x - 5 \cos 2x \times 4x^3\}}{(1x^4)^2}$$

$$= \frac{-10x^4 \sin 2x - 20x^3 \cos 2x}{x^8}$$

(6) ✓

d) $y = 5x^2 e^{4x}$

chain rule.

$$du/dx = 5x^2$$

$$= 2 \times 5x^{2-1}$$

$$= 10x$$

$$= 10x$$

$$du/dx \times dv/dx$$

$$u = 5x^2 \quad v = 1e^{4x}$$

$$dv/dx = 1e^{4x}$$

$$= 4 \times 1e^{4x}$$

$$= 4e^{4x}$$

$$\therefore 10x \times 4e^{4x}$$

X

(4) ✓

(2) $v = 10(2 - 3e^{-4t})$ initial growth $\therefore t = 0$.

$20 - 30e^{-4t}$ / get rid of 20 terms

$= 30e^{-4t}$

$\frac{dv}{dt} = -4 \times 30e^{-4 \times 0}$

$= 120e^0 = 120e. \quad \times$

(1) ✓

(4) $\int \frac{2x+1}{4x(x+2)} dx$

create A + B. $\frac{A}{4x} + \frac{B}{x+2}$.

$\frac{A(x+2) + B(4x)}{4x \times (x+2)}$.

$\therefore 2x+1 = A(x+2) + B(4x).$ ✓

$x = -2, \quad 2x-2+1 = B(4x-2)$
 $-3 = -8B \quad (\div -8)$
 $3/8 = B.$ ✓

$x = 0, \quad 2 \times 0 + 1 = A(0+2)$
 $1 = 2A \quad (\div 2)$
 $1/2 = A.$ ✓

$A = 1/2 \quad B = 3/8$
 $A = 0.5 \quad B = 0.375$

Q7

$$\frac{2x+1}{4x(x+2)} = \frac{0.5}{4x} + \frac{0.375}{(x+2)}$$

Now we can integrate. $\int \frac{a}{x} dx$

$$0.5 \ln 4x + 0.375 \ln x + 2 = a \ln x + c$$

$$\begin{aligned} x=3 & 0.5 \ln(4 \times 3) + 0.375 \ln(3+2) \\ & = 0.5 \ln(12) + 0.375 \ln(5) = 1.242453325 \\ & \quad + 0.6035392172 \\ & = 1.845992542 \end{aligned}$$

$$\begin{aligned} x=1 & 0.5 \ln(4 \times 1) + 0.375 \ln(1+2) \\ & = 0.5 \ln(4) + 0.375 \ln(3) \\ & = 1.105126789 \end{aligned}$$

$$1.845992542 - 1.105126789$$

$$= 0.7409 \text{ to 4 d.p.}$$

⑤

$$\int_1^3 \frac{2x+1}{4x(x+2)} dx$$

using simpsons rule.

$$\frac{1}{3}h[(y_0 + y_n) + 4(y_1 + y_3) + 2(y_2)]$$

 $y_0 = 1^{\text{st}} \text{ value}$ $y_n = \text{last value}$ y_1, y_2, y_3 numbered accordingly.

using 4 strips.

x	1	1.5	2	2.5	3
$\frac{2x+1}{4x(x+2)}$	0.25	0.190476	0.15625	0.13	0.116
	y_0	y_1	y_2	y_3	y_n

$$\frac{1}{3} \times 0.5 (10.25 + 0.1166) + 4 (0.190476 + 0.1333) + 2 (0.15625)$$

$$= 2.1632276$$

$$= 0.329034$$

$$\begin{array}{ccccccccc} y_0 & & y_1 & & y_2 & & y_3 & & y_n \\ 3 & & 2.5 & & 2 & & 1.5 & & 1 \end{array}$$

$$\begin{array}{ccccccc} 0.1166 & 0.1333 & 0.190476 & & & & \\ & & 0.15625 & & 0.25 & & \end{array}$$

$$\frac{1}{3} \times 0.5 (10.1166 + 1) + 4 (0.1333 + 0.190476) + 2 (0.15625)$$

=

③ i) $\int_3^4 (20x^0 + 5x^2 - 2x^3) dx$ $ax^n \Rightarrow \frac{ax^{n+1}}{n+1}$

$$= \frac{20x^{0+1}}{0+1} + \frac{5x^{2+1}}{2+1} - \frac{2x^{3+1}}{3+1} \quad \checkmark$$

$$= \frac{20x^1}{1} + \frac{5x^3}{3} - \frac{2x^4}{4} \quad \checkmark$$

$$x=4 \quad \frac{20 \times 4}{1} + \frac{5 \times 4^3}{3} - \frac{2 \times 4^4}{4}$$

$$= 80 + 106.6 \text{ (rounding)} - 128$$

$$= \cancel{314.6} \times 58.6 \quad \text{(circled)}$$

$$x=3 \quad \frac{20 \times 3}{1} + \frac{5 \times 3^3}{3} - \frac{2 \times 3^4}{4}$$

$$= 60 + 45 - 40.5$$

$$= 64.5 \quad \checkmark$$

$$58.6 - 64.5 = -5.9 \quad \checkmark$$

⑥ $\checkmark$

③ b) π
0