

PRESBYTERIAN LADIES' COLLEGE SYDNEY 1888

#### 2015 TRIAL HIGHER SCHOOL CERTIFICATE EXAMINATION

# **Mathematics**

#### **General Instructions**

- Reading time 5 minutes
- Working time 3 hours
- Write using blue or black pen Black is preferred
- Board-approved calculators may be used
- A table of standard integrals is provided at the back of this paper
- All necessary working should be shown in every question

#### Total Marks – 100

#### Section I: Pages 3-6 10 marks

- Attempt questions 1-10, using the answer sheet on page 23.
- Allow about 15 minutes for this section

#### Section II: Pages 7-19 90 marks

- Attempt questions 11-16, using the Answer Booklets provided.
- Allow about 2 hours 45 minutes for this section.

Multiple Choice	11	12	13	14	15	16	Total
							%

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Section I

10 marks Attempt Questions 1 – 10. Allow about 15 minutes for this section.

Use the multiple-choice answer sheet for Questions 1 - 10.

1.	$\left(\frac{2a}{3b}\right)$	-5 = ?
	(A)	$\frac{2a^5}{3b^5}$
	(B)	$\frac{3b^5}{2a^5}$
	(C)	$\frac{243b^5}{32a^5}$
	(D)	$\frac{1}{243b^5}$

2. Let  $\alpha$  and  $\beta$  be the solutions of  $2x^2 - 5x - 9 = 0$ . Which value is the answer to  $\frac{1}{\alpha} + \frac{1}{\beta}$ ?

(A)  $-\frac{9}{2}$ (B)  $-\frac{9}{5}$ (C)  $-\frac{5}{9}$ (D)  $\frac{5}{2}$  3. Which expression (value) is equal to  $\lim_{x\to\infty} \frac{3x^2}{x^3-x}$ ?

(A)  $\frac{3x}{x^2 - 1}$ (B) 3

(C) 
$$\frac{3}{x-1}$$

4. The period and amplitude of  $y = 3 \cos 2x$  is:

- (A) Amplitude = 2 Period =  $\frac{2\pi}{3}$
- (B) Amplitude = 3 Period =  $\pi$
- (C) Amplitude =  $\pi$  Period = 3
- (D) Amplitude =  $\frac{2\pi}{3}$  Period = 2

5. What is the value of x in the equation  $\log_a 12 - 2\log_a 2 = \log_a x$ ?

(A) 6 (B)  $\frac{1}{3}$ (C) 3 (D)  $\frac{1}{6}$ 

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6.

Which expression shows  $\cos^2\left(\frac{\pi}{2} - \theta\right) \cot\theta$  simplified fully ?

- (A)  $\cos^2 \theta \cot \theta$
- (B)  $\sin\theta\cos\theta$

(C) 
$$\frac{\sin^3 \theta}{\cos \theta}$$

(D) 
$$\sin^2 \theta \cot \theta$$

7. Which expression is equal to 
$$\int_{2}^{7} \frac{5}{x} dx$$
?

(A) 
$$5(\log_e 7 - \log_e 2)$$

(B) 
$$\frac{1}{5}(\log_e 7 - \log_e 2)$$

(C) 
$$\frac{5}{49} - \frac{5}{4}$$

8.

Which expression is the equation of the normal to the curve  $x^2 = 4y$  at the point where x = 2?

- (A) y = 1
- (B) x y 1 = 0
- (C) y = -1
- (D) x + y 3 = 0

#### 9. The function of g(x) is given by

$$g(x) = \begin{cases} x^2 - 4 & \text{for } x > 0 \\ (X) & \text{for } (Y) \end{cases}$$

Which expressions for (X) and (Y) are correct, if g(x) is an odd function?

- (A)  $(X): 4-x^2, (Y): x < 0$
- (B)  $(X): -x^2 4, (Y): x < 0$
- (C)  $(X): 4-x^2, (Y): x > 0$
- (D)  $(X): -x^2 4, (Y): x > 0$
- 10. A particle moves along a straight line. Initially it is at rest at the origin. The graph shows the acceleration, a, of the particle as a function of time t seconds for  $0 \le t \le 10$ .



At what time during the interval  $0 \le t \le 10$  is the particle furthest from the origin?

- (A) 3 seconds
- (B) 6 seconds
- (C) 7 seconds
- (D) 8 seconds

#### **End of Section I**

#### Section II

90 marks

Attempt Questions 11 – 16.

#### Allow about 2 hours and 45 minutes for this section.

Answer each question in a <u>new writing booklet</u>. Extra writing booklets are available.

In Questions 11 – 16, your responses should include relevant mathematical reasoning and/or calculations.

Question 11 (15 marks) Use a new writing booklet for Question 11.

(a) Solve  $x^2 - 2x - 7 = 0$ , expressing your answer in simplest surd form.

(b) Find 
$$\int \frac{3x}{x^2 + 1} dx$$
. 1

(c) Simplify fully :

$$\frac{2}{\sqrt{7}+3} - \frac{3\sqrt{7}}{\sqrt{7}-3}$$

(d) Find the value of *x* (correct to the nearest mm).



(e) Find the coordinates of the vertex and focus of the parabola  $x^2 - 5y + 5 = 0$ . 2

#### **Question 11 continues on page 8**

2

2

#### **Question 11 (continued)**

(f) Water flows into an empty container, so that after t minutes the volume V of water in litres is given by

$$V = \frac{12t^2}{t+4} \quad \text{for } t \ge 0.$$

What is the rate at which the water is flowing into the container at 1 minute?

(g) Evaluate 
$$\int_0^{\ln 6} e^x dx$$
.

(h) Differentiate  $y = \sin 4x$ 

**End of Question 11** 

2

Question 12 (15 marks) Use a new writing booklet for Question 12.

(a) Differentiate:

(i) 
$$y = x^3 e^{3x}$$
. 2

(ii) 
$$y = \frac{e^x}{(x+3)^2}$$
. (Full simplification of your answer is not required.) 2

(b) Solve  $\sqrt{3}\cos x = \sin x$  for  $0 \le x \le 2\pi$ .

(c) Use Simpson's Rule with five function values (x is in radians) to find an approximation for 2  $\int_{0}^{1} \tan x \, dx.$ 

(d) Evaluate  $\int_{0}^{\frac{\pi}{2}} \sec^2 3x \, dx$ 

Question 12 continues on page 10

#### (e) Use the graphs below to answer (i) and (ii).



(i) Solve the inequality  $4-x^2 \le x+2$ .

1

(ii) Calculate the area between the curve  $y = 4 - x^2$  and the line y = x + 2.



### End of Question 12

Question 13 (15 marks) Use a new writing booklet for Question 13.

(a) The diagram shows  $\triangle ABD$  and  $\triangle ACE$ , where *BD* is parallel to *CE*,

AB = AD = x cm, BC = DE = 2 cm and AD : AE = 3:4. Triangle ACE and arc CE form a sector in a circle of radius (x+2) cm. The angle of the sector is  $\theta$  radians and arc CE = 18 cm.



- (i) Find the value of  $\theta$ .
- (ii) Calculate the area of the segment cut off by *CE*.

(b) In the diagram below, OA = OB = OC. Show that  $\angle OBC = 65^{\circ}$ . Give reasons.



**Question 13 continues on page 12** 

2

2

#### **Question 13 (continued)**

(c) For the domain  $0 \le x \le 6$ , a function y = f(x) satisfies f'(x) < 0 and f''(x) < 0. Sketch a possible graph of y = f(x) in this domain.



(iv) Using the distances AB, BC and AC, or otherwise, find  $\angle CAB$  to the nearest degree.

#### **End of Question 13**

2

Question 14 (15 marks) Use a new writing booklet for Question 14.

(a) The part of the curve  $\frac{x^2}{2} + y^2 = 8$  that lies in the first quadrant is drawn below.



This part of the curve is rotated about the *x*-axis to form a solid. Find the exact volume of this solid of revolution.

- (b) For the curve  $y = x^3(3-x)$ 
  - (i) Find all stationary points and determine their nature.
  - (ii) Draw a sketch of the curve showing the stationary points, inflexion points and 3 intercepts on the axes.
- (c) The displacement of a particle moving along the *x*-axis is given by

$$x = 5\sin\frac{\pi}{2}t$$

where *x* is the displacement from the origin in metres, *t* is the time in minutes and  $t \ge 0$ .

- (i) What is the furthest distance the particle moves away from the origin? 1
- (ii) When does the particle first return to its starting position?
- (iii) Find the acceleration of the particle when  $t = 3 \min$ .

#### Question 14 continues on page 14

3

#### **Question 14 (continued)**

(d) In the quadrilateral AECD,  $\angle DAE = 90^\circ$ ,  $\angle AEC = 40^\circ$ ,  $\angle BAE = 24^\circ$  and  $\angle BCE = 50^\circ$ .

In quadrilateral *ABCD*, *AB* is parallel to *DC* and  $\angle ABC = \alpha$  as shown in the diagram.



- (i) Explain why  $\alpha = 114^{\circ}$ .
- (ii) Prove that ABCD is a parallelogram.

End of Question 14

1

Question 15 (15 marks) Use a new writing booklet for Question 15.

(a) Greg has a one hectare block of land  $(10\ 000\ m^2 = 1\ hectare\ (ha))$ . He is going to fence off three identical rectangular plots within his block for his three children. Each plot will measure x m by y m as shown in the diagram below. He will retain the remainder of the block for himself and his wife. Greg can only afford 300 m of fencing to go around the children's plots.



(i) Show that 
$$y = 75 - \frac{3x}{2}$$
. 1

(ii) Find the value of x for which the area of the children's plots will be a maximum. **3** 

(iii) Find the maximum area of one of the children's blocks.

(iv) How much of Greg's 1 hectare block is left for him and his wife?

#### **Question 15 continues on page 16**

1

#### **Question 15 (continued)**

(b) The acceleration, after *t* seconds, of a particle moving in a straight line is given by  $\ddot{x} = -\frac{14}{(t+4)^3}$ .

Initially the particle is located  $\frac{3}{4}$  m to the left of the origin and the initial velocity is  $\frac{7}{16}$  m/s.

- (i) Find the velocity v and the displacement x at any time t. 2
- (ii) What is the velocity of the particle when it passes through the origin?
- (iii) Sketch a graph of the displacement as a function of time.

(c) A curve is given by the equation  $y = 2x^{\frac{5}{2}} - x^3$ , where  $x \ge 0$ .

(i) Show that 
$$\frac{d^2 y}{dx^2} = \frac{15}{2}\sqrt{x} - 6x.$$
 1

(ii) For what value(s) of x is the curve 
$$y = 2x^{\frac{5}{2}} - x^3$$
 concave up? 2

#### **End of Question 15**

2

Question 16 (15 marks) Use a new writing booklet for Question 16.

- (a) Connor buys a new car, which begins to depreciate immediately. The value (\$V) of the car after t years is given by  $V = A e^{-kt}$ Where:
  - *A* is the initial value
  - *k* is the constant of depreciation
  - *t* is the time in years

The car is worth \$30 000 after 5 years and \$18 000 after 10 years.

(i)	Find the constant of depreciation $k$ .	3
(ii)	Find the initial value of the car.	1
(iii)	How many whole years will it take before the car's value falls below \$1 000?	2

#### **Question 16 continues on page 18**

(b) A plane leaves an airport (A) and travels due north  $190\sqrt{3}$  kilometres to a point K and then turns due west and travels a further 190 kilometres until it reaches a point P. Due to storms the plane is then diverted to a new airport (B) which is 200 kilometres on a bearing of  $280^{\circ}$  from A.



- (i) Draw the diagram in your answer booklet and label it to show the information.
- (ii) Show that  $\angle KAP = 30^{\circ}$ .
- (iii) Show that the plane needs to travel 294 kilometres from *P* to the new airport (*B*). 2
- (iv) Hence or otherwise find the bearing (to the nearest degree) on which the plane 1 flies from *P* to *B*.

#### **Question 16 continues on page 19**

(c) The diagram shows a shaded region which is bounded by the curve  $y = \log_e(2x-5)$ , the x axis and the line x = 6.

The curve  $y = \log_e(2x-5)$  intersects the x axis at A and the line x = 6 at B.



(i) Show that the coordinates of points A and B are (3, 0) and  $(6, \log_e 7)$  **1** respectively.

(ii) Show that if 
$$y = \log_e(2x-5)$$
, then  $x = \frac{e^y + 5}{2}$ . **1**

(iii) Hence find the exact area of the shaded region.

**End of Examination** 

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#### STANDARD INTEGRALS

$$\int x^n dx = \frac{1}{n+1} x^{n+1}, \quad n \neq -1; \quad x \neq 0, \text{ if } n < 0$$

$$\int \frac{1}{x} dx = \ln x, \quad x > 0$$

$$\int e^{ax} dx = \frac{1}{a} e^{ax}, \quad a \neq 0$$

$$\int \cos ax dx = \frac{1}{a} \sin ax, \quad a \neq 0$$

$$\int \sin ax dx = -\frac{1}{a} \cos ax, \quad a \neq 0$$

$$\int \sec^2 ax dx = \frac{1}{a} \tan ax, \quad a \neq 0$$

$$\int \sec^2 ax dx = \frac{1}{a} \tan ax, \quad a \neq 0$$

$$\int \sec ax \tan ax dx = \frac{1}{a} \sec ax, \quad a \neq 0$$

$$\int \frac{1}{a^2 + x^2} dx = \frac{1}{a} \tan^{-1} \frac{x}{a}, \quad a \neq 0$$

$$\int \frac{1}{\sqrt{a^2 - x^2}} dx = \sin^{-1} \frac{x}{a}, \quad a > 0, \quad -a < x < a$$

$$\int \frac{1}{\sqrt{x^2 - a^2}} dx = \ln \left(x + \sqrt{x^2 - a^2}\right), \quad x > a > 0$$

$$\int \frac{1}{\sqrt{x^2 + a^2}} dx = \ln \left(x + \sqrt{x^2 + a^2}\right)$$

NOTE:  $\ln x = \log_e x$ , x > 0

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### **Mathematics: Multiple Choice Answer Sheet**

Student Number\_\_\_\_\_

Completely fill the response oval representing the most correct answer.

1.	A 🔿	B	С	D 🔿
2.	A 🔿	B 🔿	С	D 🔿
3.	A 🔿	B 🔿	С	D 🔿
4.	A 🔿	B	С 🔾	D 🔿
5.	A 🔿	B	С 🔾	D 🔿
6.	A 🔿	B	С 🔾	D 🔿
7.	A 🔿	B	С 🔾	D 🔿
8.	A 🔿	B	С 🔾	D 🔿
9.	A 🔿	B 🔵	С	D 🔿
10.	A 🔿	B 🔘	С 🔵	<b>D</b> \(\circ)

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PLC Sydney Maths Department Ver 1 Solutions for exams and assessment tasks 2015 Academic Year iz Trial Calendar Year Quilt Mathi Name of task/exam Trial HSC Course multiple choice  $1. \left(\frac{2a}{3b}\right)^{-5} = \left(\frac{3b}{2a}\right)^{5} = \frac{243b}{32a^{5}}$  $(\mathcal{C})$  $2: \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha \beta} = \frac{5}{2} = -5 \quad \bigcirc$   $3: \lim_{x \to \infty} \frac{3x}{x^3 - x} = \lim_{x \to \infty} \frac{3x}{x^3} = \lim_{x \to \infty} \frac{3x}{x^2} = 0 \quad \bigcirc$   $\frac{3}{x^3} = \frac{1}{x^3} \quad x \to \infty \quad \frac{x}{x^3} = 0 \quad \bigcirc$ 5.  $\log_{a} 12 = \log_{a} 2^{2} = \log_{a} (\frac{12}{4})$  $= \log_{\alpha} 3$  $= \log_{\alpha} \chi$  $\therefore \chi = 3$ 6.  $\cos^2\left(\frac{\pi}{2}-0\right) \times \frac{\cos \theta}{\sin \theta} = \sin^2 \theta \times \frac{\cos \theta}{\sin \theta} = \sin^2 \theta \cos \theta$ в 7.  $\int \frac{5}{2} dx = 5 \ln x \int_{2}^{7}$ =  $5 \ln 7 - 5 \ln 2$ Page 1 of 20

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$ \begin{array}{l} \sum_{k=1}^{n} (1 + 2k) & m_{1} = -2\pi \\ m = -2\pi \\ y = -2\pi \\ y = -2\pi \\ y + 2\pi \\ y + 2\pi \\ x - 5 - 2\pi^{2} = 0 \\ (in) \\ d_{Ag} = \int (5\pi \\ -\pi \\ 7 \\ Ag = \\ g = -2\pi \\ x + 2\pi^{2} + 5 \\ y + 2\pi \\ y + 2\pi \\ x - 5 - 2\pi^{2} = 0 \\ (in) \\ d_{Ag} = \int (5\pi \\ -\pi \\ 7 \\ Ag = \\ g = $			u'-11		20,		$C(u_i)$	3)			
$m = -2\pi  C (\pi, s)$ $y = -2\pi (x - \pi)$ $y = -2\pi x + 2\pi^{2} + s$ $y + 2\pi x - s - 2\pi^{2} = 0.$ (iii) $d_{Ag} = \int (5\pi - \pi)^{2} + (3 - i)^{2}$ $= \int  6\pi^{2} + 4$ $= \int 4(4\pi^{2} + i)$ $= 2 \int 4\pi^{2} + i$ (iv) $AABC is an isosceler \Delta$ $AB = BC = 2 \int 4\pi^{2} + i, AC = 4$ $Cos (CAB = \frac{4^{2}}{4} + (2 \int 4\pi^{2} + i)^{2} - (2 \int 4\pi^{2} + i)^{2}$ $= \frac{16}{16 \int 4\pi^{2} + i}$ $= \frac{16}{16 \int 4\pi^{2} + i}$ $CAB = Bor - i (\frac{1}{\sqrt{4\pi^{2} + i}})$ $= 8i^{6}. (newart degree)$ Page 8 of 20	* when the	L to AP	ιν)	1	~ 11 ,						
$y = 5 = -2\pi ((x - \pi))^{2}$ $y = -2\pi x + 2\pi^{2} + 5$ $y + 2\pi x - 5 - 2\pi^{2} = 0.$ (iii) $d_{AB} = \sqrt{(5\pi - \pi)^{2} + (3 - i)^{2}}$ $= \sqrt{16\pi^{2} + 4}$ $= \sqrt{4(4\pi^{2} + i)}$ $= 2\sqrt{4\pi^{2} + i}$ (iv) $A + B c$ is an isosceler $A$ $A = B = B = 2\sqrt{4\pi^{2} + i},  A = 4$ $Cos < CAB = \frac{4^{2} + (2\sqrt{4\pi^{2} + i})^{2} - (2\sqrt{4\pi^{2} + i})^{2}}{2 \times 4 \times 2\sqrt{4\pi^{2} + i}}$ $= \frac{16}{16\sqrt{4\pi^{2} + i}}$ $= \frac{16}{16\sqrt{4\pi^{2} + i}}$ $= \frac{16}{16\sqrt{4\pi^{2} + i}}$ $= \frac{16}{16\sqrt{4\pi^{2} + i}}$ Page & of 20		m = -2		C(	π, s) ~)						
$ \begin{array}{l} \begin{array}{c}                                     $		y-3 = -	$-2\pi$	x + 2	$\pi^2 + 5$						
$ \begin{array}{ll} \begin{array}{c} \begin{array}{c} (11)\\ (11)\\ \end{array} & d_{AB} = \sqrt{(5\pi - \pi)^{2} + (3 - i)^{2}} \\ = \sqrt{16\pi^{2} + 4} \\ = \sqrt{4(4\pi^{2} + 1)} \\ = 2\sqrt{4\pi^{2} + 1} \\ \begin{array}{c} (1v)\\ \end{array} & ABc \ is \ an \ isosceler \ \Delta \\ \end{array} & AB = BC = 2\sqrt{4\pi^{2} + 1} \\ Cos \ (CAB = \frac{\mu^{2}}{4} + \frac{(2\sqrt{4\pi^{2} + 1})^{2} - (2\sqrt{4\pi^{2} + 1})^{2}}{2 \times 4 \times 2\sqrt{4\pi^{2} + 1}} \\ = \frac{16}{16\sqrt{4\pi^{2} + 1}} \\ = \frac{16}{16\sqrt{4\pi^{2} + 1}} \\ = \frac{16}{16\sqrt{4\pi^{2} + 1}} \\ CAB = Bc = -1 \ \left( \frac{1}{\sqrt{4\pi^{2} + 1}} \right)^{2} \\ \end{array} $ Page & of 20	L	σ 1·+2π×	- 5 -	$2\pi^{2} =$	ΞΘ,		·				
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$\int 10\pi \pi^{2} + 1$ $= \int 4(4\pi^{2} + 1)$ $= 2 \int 4\pi^{2} + 1$ (iv) $A A B c$ is an isosceler $A$ $\therefore A B = B c = 2 \int 4\pi^{2} + 1,  A c = 4$ $\cos(cAB) = \frac{4^{2} + (2 \int 4\pi^{2} + 1)^{2} - (2 \int 4\pi^{2} + 1)^{2}}{2 \times 4 \times 2 \int 4\pi^{2} + 1}$ $= \frac{16 + 4(4\pi^{2} + 1) - 4(4\pi^{2} + 1)}{16 \int 4\pi^{2} + 1}$ $= \frac{16}{16 \int 4\pi^{2} + 1}$ Page 8 of 20		5 A B =		+	( \$ -()						
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$2 \times 4 \times 2 \sqrt{4\pi^{2}+1}$ $= \frac{16 + 4(4\pi^{2}+1) - 4(4\pi^{2}+1)}{16\sqrt{4\pi^{2}+1}}$ $= \frac{16}{16\sqrt{4\pi^{2}+1}}$ $= \frac{16}{16\sqrt{4\pi^{2}+1}}$ $\leq CAN = Ros - 1 \left(\frac{1}{\sqrt{4\pi^{2}+1}}\right)$ $= 81^{\circ} (nearest degree) \qquad Page 8 of 20$	Ce	es (CAB =	42	+ (2	$\int 4\pi^2 + 1$	$)^{2} - (2 \sqrt{4\pi^{2} + 1})$	)				
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		- <u>9</u> x 2	+ 225 - 9	x Z		
	-	- 18	× +225			
0	$\frac{l^2 A}{l x^2} = -$	-18	<0 .'- n	nax.		
	$\frac{dA}{dn} =$	0 '	for stat.	pt.		
	- 18	X +	-225-20			
			$n = \frac{225}{9}$			
	-	, -	at $\chi = \frac{2\pi}{9}$	maximi	In area	
			$\chi = 2$	, Ş	Page / 3 of	20

PLC	Sydney	Maths	Department
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Solutions for exams and assessment tasks

1	Solutions for exams a		Calendar Vear	2015	_
	Academic real	12 Duit the les	Name of took/over	T-11 454	
	Course	Whit Marins	Name of task/exam	Mai Hac	
r	maximun	n area of o	ne of the d	ildrens	
	blocks i	A= xy	0		
	6	t = 25	$y = 75 - \frac{3}{2}$	(25)	
		÷	= 75		
	ŕ,	Aver = 25	× 75		
		= 937	15 m		
	A		10000 - 3	× 93715	v
(1)	Wer T	enaining =	7187-5	m <sup>2</sup> .	
				۱.	
					·
		•			, · , ·
				· .	
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Solutions for exams	and assessment tasks	Calendar Vear	2015	]	
Course	Zimit Math	Name of task/exam	Trial HSC	-	
Question 15 b. $\chi = -\overline{C}$	Untine d 14 t+43				
at t = 0; (i) $\chi = -14$	$k = -\frac{3}{4},  \lambda =$	7 m/s.	·		
= - 14 5	$(t+4)^{-3} d t$				
= -14 [	$\frac{(t+4)^{-2}}{-2}$ ] +	C			
= 70	$(+++)^{-2} + C$				
at $t=0$	$\varkappa = \frac{7}{16}$				
$\frac{7}{16} = 7(0+$	-4) <sup>-2</sup> + C				
$\frac{7}{16} = \frac{7}{16} + \frac{7}{16} $	с О				
× =	$\frac{7}{(t+4)^{2}}$				
$x = 7 \int (t)$	$-4)^{-2}dt$				
$\chi = \frac{7(t+4)}{-1}$	$)^{-1} + c$				
at $t=0$	$n = \frac{2}{4}$	Υ.	Page /S of	20	

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	Solutions	for exams a	and assessment tasks				Y CI I
	Academi	c Year	/2	Calendar Year	201	C ]	
	Course		2. Fulle K	Nome of tosk/exam	TAI	450	
	Course	· · · · · · · · · · · · · · · · · · ·	wint matur	INALLIC OI LASK/CAALLI	1/121	,	
	- 3 -	ing Binar Distan	(4) + C				
	C =	- 3 4	+ 7 4				
	C =	1	. *				
-	1	χ=	- 7 +1 ++4		•		
( 1	i) at	t x	= 0	•			
		0 =	-7 +1				
			-++4			1 1	
		0 = -	-7 + + + + +	•			
		t =	3				
	, ,		- · · · · · · · · · · · · · · · · · · ·				
	X	= (+	(+4)				
			7				
		) = _	ר) ארי דער די ג				
0		·4 ×	<u>r</u>				
	")						
		$-\frac{3}{4}$	3	>t			
	-			at $t=0$	$\chi = -\frac{3}{2}$		
		χ = -	上 +1 七+4		φ Pag	e /6 of 6	20

PLC Sydney Maths Department Solutions for exams and assessment tasks

	Academic Year	12	Calendar Year	2015	
	Course	Zupit Makus	Name of task/exam	Tral HSC	
C , (1)	$dy = 2x$ $dy = 5x^{2}$ $dy = 15x$ $dx^{2} = 15x$ $z$ $dx^{2} = 15x$	$\frac{5}{2} - \frac{3}{2}$ $\frac{1}{2} - 6x$ $\frac{1}{2} - 6x$	ţ		
(īi)	$\frac{d^2 y}{dx^2} > 0$ $\frac{15}{2} \times x^2 - 6$	n 70		۰,	
	3 x 2 ( 5 -	252)>0	-21	$7x + \frac{5}{2} = 0$ $25x = \frac{5}{2}$	
	0 <	$(heck) \frac{2.5}{16}$ $\chi < \frac{2.5}{16}$		$4x = \frac{25}{4}$ $x = \frac{25}{16}$	
m	ethod 2:	1552 - 62	270	۲.	
	since Jre ?	$raise = 15 \sqrt{2}$	6x >0 (length)		
	then	225 x > 4	36x <sup>2</sup> (s	quare bok side)	
		$225 \times 7$ $144x^2 - 225$ x(144x - 3)	225) $20225)$ $202376$	144x = 22 257 76 Page 17 of 20	5 1.2. 2.

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PLC Sydney Maths Department Solutions for exams and assessment tasks

	Academic Year	12	Calendar Year	2015	
	Course	2Unit Maths	Name of task/exam	That HISC	
Qu	estion 16.				
a.	$V = A e^{-kt}$	<i>k.</i>	ł		
	$BODOD = Ae^{-S}$	K			
. /	$8000 = Ae^{-10k}$				
(Ì)	Ae	= 30000			
	Ae <sup>-lok</sup>	18000	>		
	esk	= 5		·	
	5K =	$ln \frac{5}{3}$			`
	k = -	$\frac{1}{5} \ln\left(\frac{5}{3}\right)$			
	2	0.102165			
(11)	30000	$= A e^{-5}$	$\frac{1}{5}\ln\left(\frac{5}{3}\right)$		
	30000	$= A e^{-hf_s^s}$	5) <u>not</u> e	$-\ln(\frac{5}{3}) \ln \frac{1}{2}$	2/15
	A =	20 000		$=\frac{2}{3}$	
	A =	\$20 000 3 3			
(11)	1000	= 50000	-krt	`	
	$\frac{1}{50}$	-kxt			
	· _kt	$= ln\left(\frac{1}{50}\right)$			•
	t =	$= \frac{\ln 50}{-\frac{1}{5}\ln(\frac{5}{3})}$	what k?	$\frac{1}{5}\left(\ln\left(\frac{5}{5}\right)\right)$	_
	t t	= 38.29		· .	
		39 years fail below ?	fa Fit to \$ 1000	Page/8 of	20

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PLC Sydney Maths Department					
Solutions for exams an	Solutions for exams and assessment tasks			1	
Course	2010 St 11 An Ales	Name of task/exam	Traditise	1	
Course b(i) ii) $\tan \theta = \frac{190}{400}$ $\tan \theta = \frac{1}{\sqrt{3}}$ $\theta = 30^{\circ}$ (iii) $\langle PAB = 50^{\circ}$ $PB^{2} = 200^{\circ} + 10^{\circ}$	$\frac{20\pi it Madlus}{190}$ $\frac{190}{10}$	Name of task/exam $AP = 30^{7}$ . $AP = 30^{7}$ . $AP = 30^{7}$ .	<u>Tria ( 195</u> ) <sup>2</sup> 380 km, 50	]	
= 86696 $= 294.4$ $= 294.4$	283 742326				
(iv) <apb;< td=""><td><math display="block">\frac{\sin \alpha}{200} = \frac{\sin \alpha}{200} = </math></td><td><math display="block">\frac{51n}{294.442326}</math> <math display="block">\frac{290}{294.442326}</math> <math display="block">\frac{290}{294.442326}</math> <math display="block">1^{9} 21^{1}</math> <math display="block">150 + 31^{9} 2</math> <math display="block">= 181^{9} 2</math></td><td>Page 16 of</td><td>20</td></apb;<>	$\frac{\sin \alpha}{200} = \frac{\sin \alpha}{200} = $	$\frac{51n}{294.442326}$ $\frac{290}{294.442326}$ $\frac{290}{294.442326}$ $1^{9} 21^{1}$ $150 + 31^{9} 2$ $= 181^{9} 2$	Page 16 of	20	

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PLC Sydney Maths Department

	Solutions for exams and assessment tasks						
	Academic Year	12	Calendar Year	2015			
	Course	Zunit math	Name of task/exam	Trial HISC			
С.	(i) $y = \log \frac{1}{2}$	e (2n-5)					
at	x=6 Y	= loge (12 -	-2)				
		= loge 7	B (6, 1n=	+)			
at	y=0 0	$= \log_e(2x-5)$	)				
	e	= 2×-5					
	22	= 6					
	2	= 3 A(3, 0)	)				
	4= 10g (	276-5)					
	$e^{\gamma'} = 2x - 5$	-					
	$2\pi = e^{\gamma} +$	- 5					
	$\chi = \frac{e^{Y} + 1}{2}$	5	lege7				
(Tij)	Arrackect = 6 = 6	$\times \log_e 7$		3 6 22			
A	ea bound by	y -orxis:	1.7	1			
	A= Sey+5	$dy = \frac{1}{2} \int (e$	e7+5y)]				
	0 2	$=\frac{1}{2}\left[e^{it}\right]$	$n^{7} + 5 \ln 7 - ($	e"+ 5(0))]			
		= 1 [7	+5127-1]		•		
		$=\frac{1}{2}\begin{bmatrix}6\\ 2\end{bmatrix}$	+ 5 In 7]				
		= 3 +_	5ln7.		~		
(	Charled 6	yea = 6	$\ln 7 - 3 - 5$	In 7			
-	, J VGLOULD	$=\frac{7}{2}$	$\ln 7 - 3$ ,				
				4			
				Page 20 of	20		

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