
Centre Number

Student Number

SCEGGS DARLINGHURST

TRIAL EXAMINATION 2001

Mathematics

Year 12

2/3 Unit

TIME ALLOWED: 3 hours (plus 5 minutes reading time)

This is a TRIAL PAPER only and does not necessarily reflect the content or format of the Higher School Certificate Examination for this subject.

ASSESSMENT WEIGHTING 40%

Directions to Candidates:

- Attempt all ten questions. All questions are of equal value.
- Ensure that your student number is on this paper.
- All necessary working should be shown in every question. Marks may be deducted for careless or badly arranged work.
- Approved scientific calculators should be used. Mathematical templates and geometrical instruments may be used.
- Begin each question on a new page - write your number at the top of each page.
- The table of standard integrals is printed on the last page.

Question 1. (12 Marks) **Marks**

(a) Factorise:

(i) $4y^2 - 100$ **1**

(ii) $k^3 - 8$ **1**

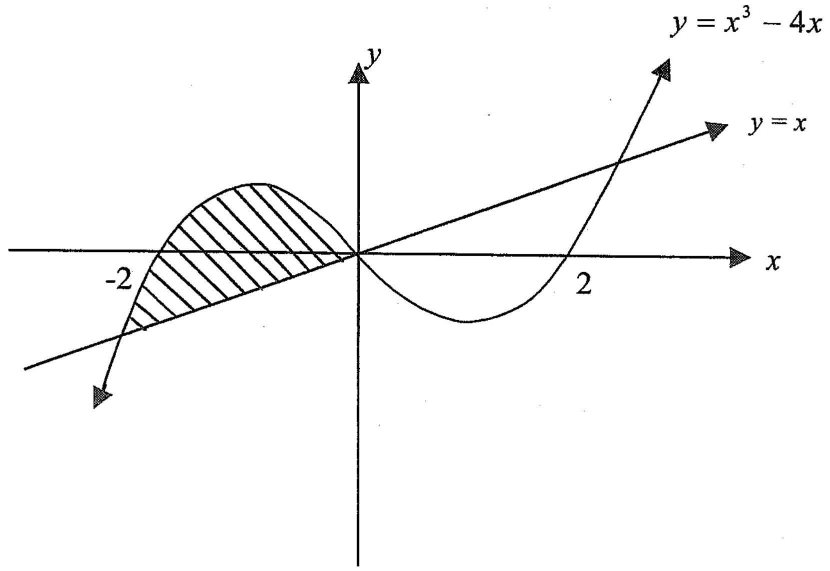
(b) Rationalise $\dfrac{8}{3-\sqrt{5}}$ **2**

(c) Solve $\dfrac{2x}{3} - \dfrac{x+1}{4} = 1$ **2**

(d) Express $0.0\dot{6}$ as a fraction in simplest form **2**

(e) Solve $x^2 + 4x + 3 \geq 0$ **2**

(f) Write a pair of inequalities to describe the shaded region: **2**



Question 2. (12 Marks) **Start a new page.**

Marks

Consider $A(-6, -5)$ and $B(8, 9)$

(a) Calculate the distance AB, in simplest form **1**

(b) Find the equation of the line joining A and B in general form **3**

(c) Find C, the midpoint of AB **1**

(d) Calculate the perpendicular distance of $D(0, 3)$ from the line AB **1**

(e) Show that DC has the equation $x + y - 3 = 0$ **2**

(f) Write down the co-ordinates of E such that E lies on DC produced and DC = CE **1**

(g) What sort of quadrilateral is AEBD?
Justify your answer **2**

(h) Hence, find the area of AEBD **1**

Question 3. (12 Marks) **Start a new page**

Marks

(a) 20 identical cards numbered 1 to 20 are placed in a bag, and one is drawn out at random. **2**

What is the probability that this card will be less than 10 or divisible by 4?

(b) Differentiate:

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

(ii) $y = \dfrac{\sin 3x}{x}$ **2**

(c) Find

(i) $\displaystyle\int \frac{dx}{x+5}$ **2**

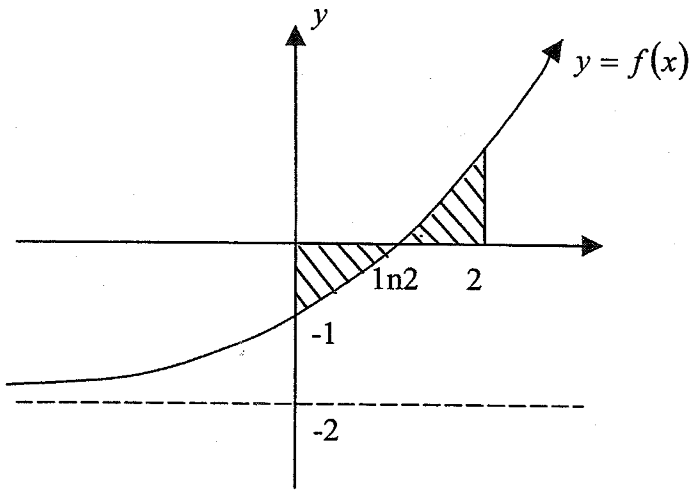
(ii) $\displaystyle\int \sec^2 5x \, dx$ **2**

(d) Prove that $\dfrac{\sin\theta}{\cos\theta}\left(1-\cot^2\theta\right) + \dfrac{\cos\theta}{\sin\theta}\left(1-\tan^2\theta\right) = 0$ **2**

Question 4 (12 Marks) **Start a new page**

Marks

(a)



(i) Write an expression to describe the shaded area. **2**

(ii) Give a possible equation for $y = f(x)$ **1**

(b) Evaluate $\sum_{k=2}^{6} 3^k$ **2**

(c) Show that the equation of the tangent to the curve $y = \ln(x^2 + 3)$ at the point $x = 3$ is $x - 2y + \ln 144 - 3 = 0$ **2**

(d) A function $y = f(x)$ has a stationary point at $(1, 2)$ and $f''(x) = 6x - 2$

Find:

(i) the equation of the function. **3**

(ii) the co-ordinates of the other stationary point and determine its nature. **2**

Question 5. (12 Marks) **Start a new page**

Marks

(a) The table shows the values of a function $f(x)$ for five x values. 3

x	1	1·5	2	2·5	3
$f(x)$	1·011	1·179	1·322	1·447	1·559

Approximate the value of $\int_1^3 f(x)\,dx$ using the five values and Simpson's Rule.

(b) Find the values of m for which the equation $x^2 + 4mx + 8 - 4m = 0$ has equal roots 2

(c) Consider the function $f(x) = x^3 - 12x + 16$

(i) Find the co-ordinates of any stationary points and determine their nature. 2

(ii) Find any points of inflexion 2

(iii) Sketch the curve $y = f(x), -5 \le x \le 3$ 2

(iv) Find the minimum value of the curve in this domain. 1

Question 6. (12 Marks) **Start a new page**

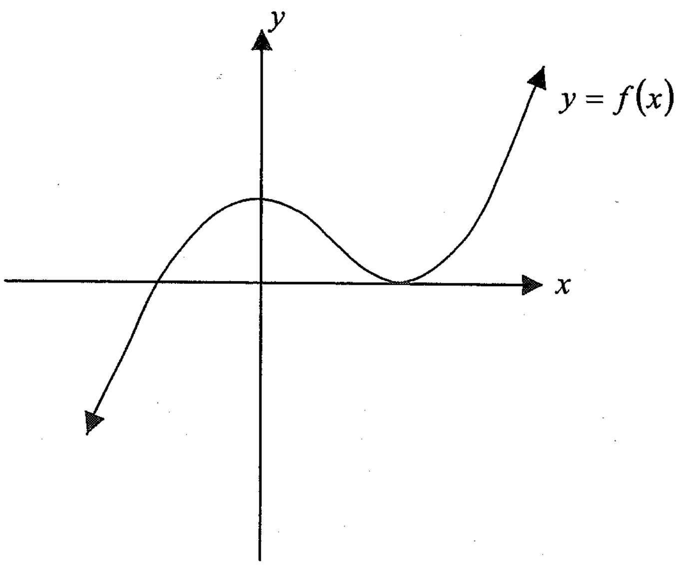
Marks

(a) Consider the curve $(x-4)^2 = 16(y-2)$

(i) Write down the co-ordinates of the focus. **2**

(ii) State the equation of the directrix. **1**

(b)



Copy this diagram onto your answer page.

(i) On the same set of axes, sketch $y = f'(x)$ **1**

(ii) On the same set of axes, using a dotted line, sketch a primitive of $y = f(x)$ **2**

(c) The sum of the height, $h$cm, of a cylinder and the circumference of its base of radius $r$cm, is 10cm.

(i) Show that $h = 10 - 2\pi r$ **1**

(ii) Show that the volume of the cylinder is $V = \pi r^2 (10 - 2\pi r)$ **1**

(iii) Find the exact value of r at which the volume of the cylinder is a maximum **3**

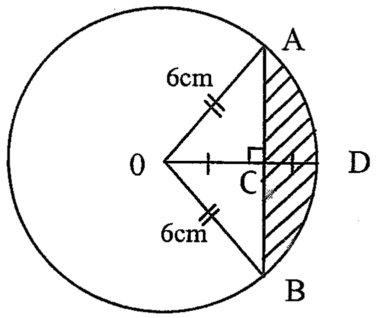
(iv) Hence find the maximum volume of the cylinder, correct to 2 decimal places. **1**

Question 7. (12 marks) **Start a new page**

Marks

(a) Solve $e^{2x} - 4e^{x} - 5 = 0$. **3**

(b)



0 is the centre of the circle. Find the exact value of the shaded area. **3**

(c) (i) Sketch the curve $y = -\sin(2x)$ and $y = \frac{x}{3}$ on the same axes in the domain $0 \le x \le \pi$ **2**

(ii) Hence, state the number of solutions to the equation $-\sin(2x) = \frac{x}{3}$ in the domain $0 \le x \le \pi$ **1**

(iii) One solution was approximated as $1 \cdot 9$.
Use this approximation to calculate the area between the two functions in the domain $0 \le x \le 1 \cdot 9$ correct to 1 decimal place. **3**

Question 8. (12 Marks) **Start a new page**

Marks

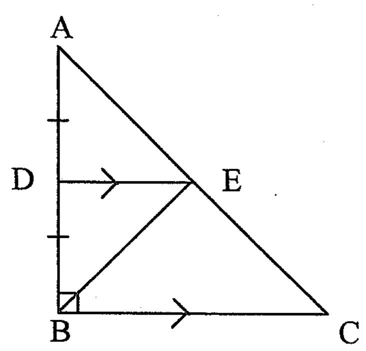
(a) Sally and Brett decide to buy a new house for \$300000. They agree to pay back the loan in equal monthly instalments of \$$P$ over 20 years.

Interest is charged at 6% p.a., compounded monthly.

(i) Show that the amount Sally and Brett owe at the end of the second month is: $A_2 = 300000\,(1\cdot 005)^2 - P\,(1 + 1\cdot 005)$ **2**

(ii) Hence, calculate the value of each monthly instalment, \$$P$. **3**

(b) Triangle ABC has a right angle at B, D is the midpoint of AB, and DE||BC.



(i) Find the size of $\angle$ ADE, giving reasons **1**

(ii) Prove that Δ AED $\equiv \Delta$BED **2**

(iii) Prove that BE = EC **2**

(c) Sketch a curve that has all of the following properties: **2**

$f(2) = 1$

$f'(2) = 0$

$f''(2) = 0$

$f'(x) \geq 0$ for all real x

Question 9. (12 Marks) **Start a new page**

Marks

(a) The percentage of the Mathematics course that is understood by the students in October is given by the equation:

$$P = \frac{-x^2}{1280}(4x - 240)$$

where x is the number of revision assignments completed and P is the percentage of the course that is understood.

(i) Show that a student completing 40 assignments understands 100% of the course. **2**

(ii) With reference to a graph, or otherwise, explain what happens when $x > 40$ **2**

(iii) Find the value of x, $0 \le x \le 40$ for which the percentage of the course being understood increases at the greatest rate. **2**

(b) (i) On the same set of axes, sketch $y = e^x + 1$ and $y = e + 1$ **1**

(ii) Find the co-ordinates of the single point of intersection. **1**

(iii) The area between $y = e + 1$, the y-axis and $y = e^x + 1$ is rotated about the x-axis. **4**

Find the volume of the solid of revolution formed.

Question 10. (12 Marks) **Start a new page.**

Marks

(a) A particle is moving in a straight line.
At time, t seconds, its distance, x metres, from a fixed point 0 is given by

$$x = 2 + 2\sin\frac{\pi}{4}t$$

(i) Calculate its initial position. 1

(ii) Find its exact velocity after 1 second. 2

(iii) Find the position of the particle when the particle is stationary for the second time. 2

(b) (i) Draw a table showing the outcome of rolling two dice and recording their sum. 1

(ii) Hence, copy and complete the following table of probabilities. 4

P (even number closer to 5 rather than 10)	
P (even number closer to 10 rather than 5)	
P (odd number closer to 5 rather than 10)	
P (odd number closer to 10 rather than 5)	

(iii) Year 2 students at SCEGGS play a game called Banko. 2
Two players, A and B, each begin with 18 blue counters and 12 red counters.
The teacher rolls two dice and the sum is noted.
If the sum of the numbers is **even**, then Player A removes one of Player B's counters.
If the sum of the numbers is **odd**, then Player B removes one of Player A's counters.
The **colour** of the counter to be removed is determined as follows:

- a red counter is removed if the sum is closer to 5 than 10.
- a blue counter is removed if the sum is closer to 10 than 5.

The winner is the first person to remove **all** the other player's counters.

Use your results from part (ii) to explain whether or not this game is fair.

END OF PAPER

SB : Q1-5

MATHEMATICS TRIAL SOLUTIONS, 2001

QUESTION 1: (12 marks)

(a) (i) $4(y^2-25)$

$= 4(y+5)(y-5)$ ✓

(ii) $(k-2)(k^2+2k+4)$ ✓

(b) $\dfrac{8}{3-\sqrt{5}} \times \dfrac{3+\sqrt{5}}{3+\sqrt{5}} = \dfrac{24+8\sqrt{5}}{9-5}$ ✓

$= 6+2\sqrt{5}$ ✓

(c) $\dfrac{2x}{3} - \dfrac{x+1}{4} = 1$

$8x - 3(x+1) = 12$ ✓

$5x - 3 = 12$

$5x = 15$

$\therefore x = 3$ ✓

(d) Let $x = 0.06666...$

$\therefore 10x = 0.6666....$

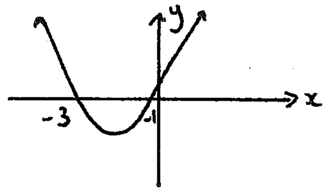
$100x = 6.666...$ ✓

$\therefore 90x = 6$

$x = \dfrac{6}{90} = \dfrac{1}{15}$ ✓

(e) $x^2+4x+3 \geq 0$

$(x+3)(x+1) \geq 0$



✓

$\therefore x \leq -3$ and $x \geq -1$ ✓

(f) $y \leq x^3 - 4x$ ✓ Com 2

and $y \geq x$ ✓

QUESTION 2: (12 marks)

(a) $AB = \sqrt{(8--6)^2+(9--5)^2}$

$= \sqrt{196+196}$

$= \sqrt{392}$ ✓

$= 14\sqrt{2}$

(b) $m_{AB} = \dfrac{9--5}{8--6} = 1$ ✓

$y-9 = 1(x-8)$

$y = x+1$ ✓

$\therefore x-y+1=0$ ✓

(c) $C(1,2)$ ✓

(d) $d = \dfrac{|0-3+1|}{\sqrt{1^2+1^2}}$

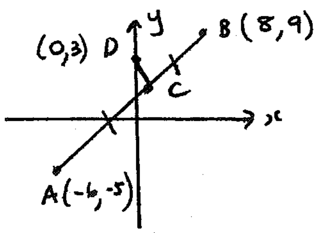
$= \dfrac{2}{\sqrt{2}}$ ✓ $(=\sqrt{2})$

(e) $m_{DC} = \dfrac{3-2}{0-1} = -1$ ✓

$\therefore y-3 = -1(x-0)$

$x+y-3=0$ ✓

(f)



$E(2,1)$ ✓

(g) Diagonals bisect each other at right angles $\therefore$ Rhombus. ✓ ✓ Reas 2

(h) $\frac{1}{2} \times 14\sqrt{2} \times 2\sqrt{2} = 28$ units^2 ✓

QUESTION 3: (12 marks)	QUESTION 4: (12 marks)
(a) $\frac{9+3}{20} = \frac{3}{5}$ ✓	(a) (i) Area $= \left\lvert \int_0^{\ln 2} f(x)\,dx \right\rvert + \int_{\ln 2}^{2} f(x)\,dx$ ✓ ✓ Com 3
(b) (i) $u = x^2$ $v = e^{3x}$; $u' = 2x$ $v' = 3e^{3x}$ ✓	(ii) $y = e^x - 2$ ✓
$\frac{dy}{dx} = 2xe^{3x} + 3x^2e^{3x}$	(b) $\sum_{k=2}^{6} 3^k = 9 + 27 + 81 + 243 + 729$
Calc 4 $= xe^{3x}(2 + 3x)$ ✓	$= 1089$
(ii) $u = \sin 3x$ $v = x$; $u' = 3\cos 3x$ $v' = 1$ ✓	OR $\frac{9(1-3)}{1-3} = 1089$ ✓✓
$\frac{dy}{dx} = \frac{3x\cos 3x - \sin 3x}{x^2}$ ✓	(c) $y = \ln(x^2+3)$
(c) (i) $\int \frac{dx}{x+5}$	$\frac{dy}{dx} = \frac{2x}{x^2+3}$
Calc 4 $= \ln(x+5) + C$ ✓ ✓+C	At $x = 3$, $\frac{dy}{dx} = \frac{6}{12} = \frac{1}{2}$ ✓
(ii) $\int \sec^2 5x\,dx$	At $x = 3$, $y = \ln 12$
$= \frac{1}{5}\tan 5x + C$ ✓✓	$\therefore y - \ln 12 = \frac{1}{2}(x - 3)$
(d) LHS $= \frac{\sin\theta}{\cos\theta}(1 - \cot^2\theta) + \frac{\cos\theta}{\sin\theta}(1 - \tan^2\theta)$	$2y - 2\ln 12 = x - 3$ ✓
$= \frac{\sin\theta}{\cos\theta} - \frac{\cos\theta}{\sin\theta} + \frac{\cos\theta}{\sin\theta} - \frac{\sin\theta}{\cos\theta}$ ✓	$\therefore x - 2y + 2\ln 12 - 3 = 0$
Reas 2 $= 0$	$x - 2y + \ln 144 - 3 = 0$
$=$ RHS ✓	(d) (i) $f''(x) = 6x - 2$
	$f'(x) = 3x^2 - 2x + C$ ✓
	But $(1,2)$ is stat point
	$\therefore 0 = 3 - 2 + C$
	$\therefore C = -1$
	$\therefore f'(x) = 3x^2 - 2x - 1$ ✓
	$\therefore f(x) = x^3 - x^2 - x + C$
	$(1,2)$ lies on curve
	$\therefore 2 = 1 - 1 - 1 + C$
	$\therefore C = 3$
	$\therefore f(x) = x^3 - x^2 - x + 3$ ✓

(ii) Stat point $\Rightarrow f'(x) = 0$

$$3x^2 - 2x - 1 = 0$$

$$(3x+1)(x-1) = 0$$

$$\therefore \quad x = 1 \text{ or } -\tfrac{1}{3}$$ ✓

$$y = 2 \text{ or } \tfrac{86}{27}$$

when $x = -\frac{1}{3}$, $f''(x) = -4$ ✓

$\therefore \left(-\frac{1}{3}, \frac{86}{27}\right)$ is a max t.p.

QUESTION 5: (12 marks)

(a)

1	1·5	2	2·5	3
1·011	1·179	1·322	1·447	1·559
1	4	2	4	1
1·011	4·716	2·644	5·788	1·559

$\Sigma = 15{\cdot}718$ ✓

$$\text{Area} \doteqdot \tfrac{1}{3} \times \tfrac{1}{2} \times 15{\cdot}718$$ ✓

$$\doteqdot 2{\cdot}62 \text{ units}^2 \ (2\text{ dp})$$ ✓

(b) Equal roots $\Rightarrow \Delta = 0$

$$\therefore (4m)^2 - 4 \times 1 \times (8 - 4m) = 0$$ ✓

$$16m^2 + 16m - 32 = 0$$

$$m^2 + m - 2 = 0$$

$$(m+2)(m-1) = 0$$

$$\therefore m = -2 \text{ or } 1$$ ✓

(c) (i) $f'(x) = 3x^2 - 12$

Stat. points occur $f'(x) = 0$ Calc 7

$$0 = 3x^2 - 12$$

$$\therefore x = \pm 2$$

$$y = 0, 32$$ ✓

$$f''(x) = 6x$$

when $x = 2$, $f''(x) = 12 > 0$

$\therefore (2, 0)$ is min t.p.

when $x = -2$, $f''(x) = -12 < 0$ ✓

$\therefore (-2, 32)$ is max t.p.

(ii) Possible p.o.i occur $f''(x) = 0$

$$6x = 0$$

$$\therefore x = 0$$

$$y = 16$$ ✓

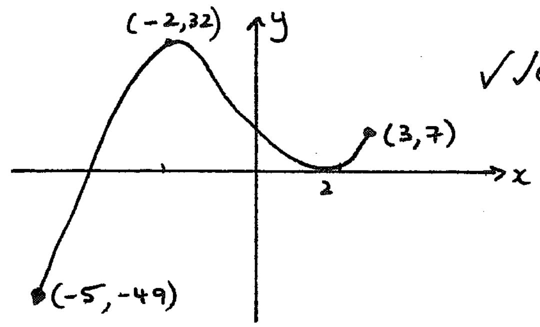
Test:

x	0^-	0	0^+
$f''(x)$	−ve	0	+ve

$\therefore$ Change in concavity ✓

$\therefore (0, 16)$ is a point of inflexion.

(iii)



✓ ✓ endpoints

(iv) Min value is −49. ✓

QUESTION 6: (12 marks)

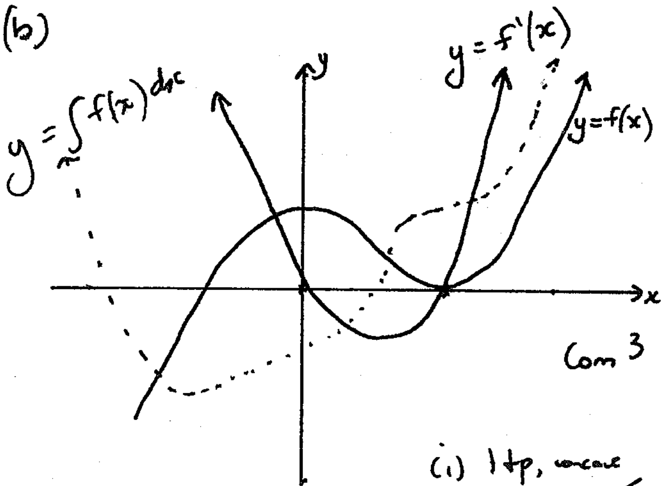
(a) (i) Vertex: $(4, 2)$ ✓

Focal length $= 4$

$\therefore$ Focus $(4, 6)$ ✓

(ii) $y = -2$ ✓

(b)



Com 3

(i) 1 tp, concave up ✓

(ii) horizontal POI and min ✓✓

(c) (i) $h + 2\pi r = 10$ ✓

$\therefore h = 10 - 2\pi r$

(ii) $V = \pi r^2 h$ ✓

$= \pi r^2 (10 - 2\pi r)$

(iii) $V = 10\pi r^2 - 2\pi^2 r^3$

$\frac{dV}{dr} = 20\pi r - 6\pi^2 r^2$ ✓

$20\pi r - 6\pi^2 r^2 = 0$

$2\pi r(10 - 3\pi r) = 0$

$\therefore r = 0$ and $r = \frac{10}{3\pi}$ ✓

$\frac{d^2V}{dr^2} = 20\pi - 12\pi^2 r$

when $r = \frac{10}{3\pi}$, $\frac{d^2V}{dr^2} < 0$ ✓

$\therefore r = \frac{10}{3\pi}$ maximises volume.

(iv) $V = 10\pi\left(\frac{10}{3\pi}\right)^2 - 2\pi^2\left(\frac{10}{3\pi}\right)^3$

$\doteq 11.79$ (2 dp) ✓

QUESTION 7: (12 marks)

(a) $e^{2x} - 4e^x - 5 = 0$

Let $u = e^x$

$\therefore u^2 - 4u - 5 = 0$ ✓

$(u-5)(u+1) = 0$

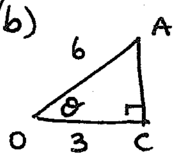
$\therefore u = 5$ or -1 ✓

$\therefore e^x = 5$ or $e^x = -1$ no solutions

$\therefore x = \ln 5$ ✓

$\therefore x = \ln 5$.

(b)



Meas 3

$\theta = \frac{1}{2}$

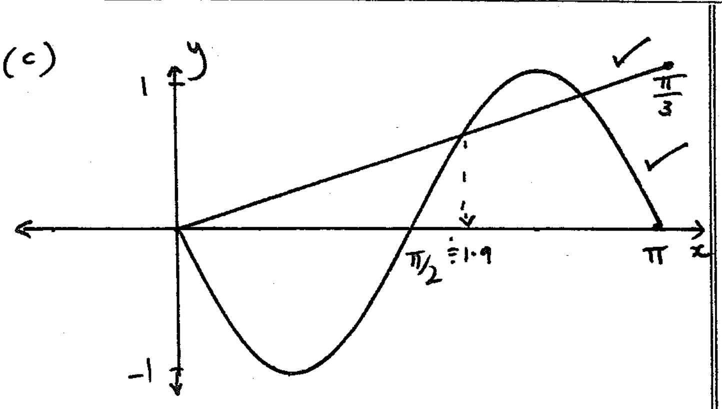
$\therefore \theta = \frac{\pi}{3}$ ✓

$\therefore$ Area $= \frac{1}{2} \times 6^2 \times \left(\frac{2\pi}{3} - \sin\frac{2\pi}{3}\right)$ ✓

$= 12\pi - 18 \times \frac{\sqrt{3}}{2}$

$= 12\pi - 9\sqrt{3}$ ✓

(c)



(ii) 3 ✓

(iii) $A \doteqdot \int_0^{1\cdot 9} \frac{x}{3} + \sin 2x \, dx$ ✓

$= \left[\frac{x^2}{6} - \frac{1}{2}\cos 2x \right]_0^{1\cdot 9}$ ✓

$= (0\cdot 602 + 0\cdot 395) - (0 - \frac{1}{2})$

$\doteqdot 1\cdot 497$ ✓

QUESTION 8: (12 marks)

(a) (i) $A_1 = 300{,}000(1\cdot 005) - P$ ✓

$A_2 = A_1(1\cdot 005) - P$

$= 300{,}000(1\cdot 005)^2 - P(1 + 1\cdot 005)$ ✓

(ii) $A_3 = A_2(1\cdot 005) - P$

$= 300{,}000(1\cdot 005)^3 - P(1 + 1\cdot 005 + 1\cdot 005^2)$

⋮

$A_n = 300000(1\cdot 005)^n - P(1 + 1\cdot 005 + \ldots + 1\cdot 005^{n-1})$ ✓

But $A_{240} = 0$

$\therefore 0 = 300000(1\cdot 005)^{240} - P(1 + 1\cdot 005 + \ldots + 1\cdot 005^{239})$

$S_{240} = \frac{1(1\cdot 005^{240} - 1)}{0\cdot 005}$

$\doteqdot \$462\cdot 04$ ✓

$\therefore P = 300000(1\cdot 005)^{240} \div$

$\doteqdot \$2149\cdot 29$ ✓

∴ Sally + Brett pay back each month.

(b) (i) $\angle ADE = 90°$ (corresponding ∠ = as $DE \parallel BC$) ✓

(ii) DE is common

$\angle ADE = \angle BDE = 90°$

$AD = DB$ (given) ✓✓

$\therefore \triangle AED \equiv \triangle BED$ (SAS)

(iii) $\angle AED = \angle BED$ (corresponding ∠ in ≡ Δ are =) ✓

But $\angle AED = \angle ECB$ (corresponding ∠ = as $DE \parallel BC$)

Reas 2

and $\angle BED = \angle EBC$ (alt. ∠ = as $DE \parallel BC$)

$\therefore \angle ECB = \angle EBC$ ✓

$\therefore BE = EC$ (sides opp = ∠ in an isosceles Δ are =)

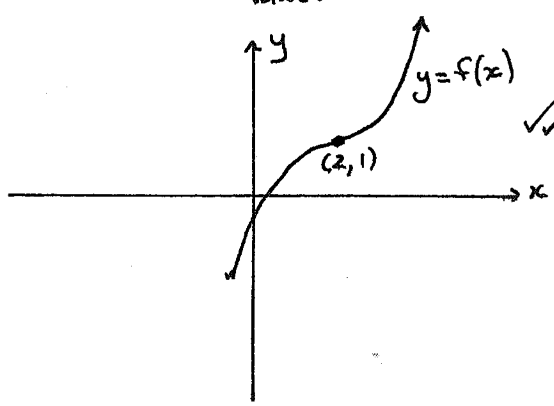
(c) $f(2) = 1$ ⇒ passes through (2, 1)

$f'(2) = 0$ ⇒ stat. point at (2, 1)

$f''(2) = 0$ ⇒ neither concave up or down at (2, 1) ie point of inflexion

$f'(x) \geq 0$ ⇒ curve increasing or stationary for all values of x

Com 2



✓✓

QUESTION 9: (12 marks)

(a) (i) $P = \frac{-x^2}{1280}(4x - 240)$

when $x = 40$,

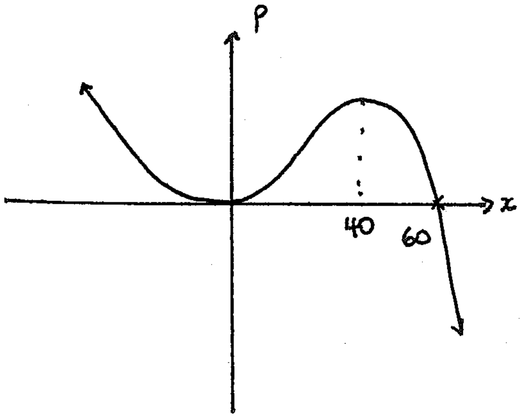
$P = \frac{-40^2}{1280}(160 - 240)$ ✓

Calc 6

$= 100$ ✓

∴ A student completing 40 assignments understands 100% of the course.

(ii)



$P = -\frac{4x^3}{1280} + \frac{240x^2}{1280}$

$= \frac{-x^3}{320} + \frac{3x^2}{16}$

$\frac{dP}{dx} = \frac{-3x^2}{320} + \frac{6x}{16}$ ✓

Stationary pts ⇒ $\frac{dP}{dx} = 0$

ie $\frac{-3x^2}{320} + \frac{6x}{16} = 0$

$\frac{x}{320}(-3x + 120) = 0$

ie $x = 0$ or 40

∴ when $x > 40$, the percentage of the course understood decreases. ✓

(iii) $\frac{d^2P}{dx^2} = \frac{-6x}{320} + \frac{3}{8}$

$= \frac{-3x}{160} + \frac{3}{8}$ ✓

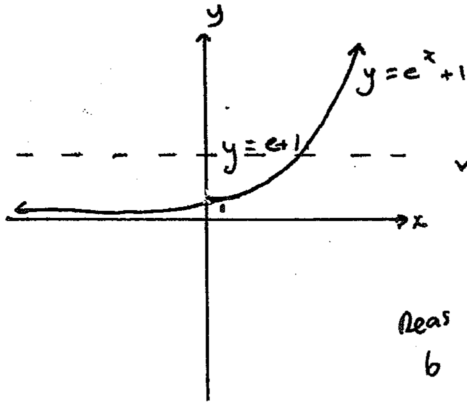
$\frac{-3x}{160} + \frac{3}{8} = 0$

$\frac{3x}{160} = \frac{3}{8}$

$x = 20$ ✓

∴ Increasing at the greatest rate when $x = 20$.

(b) (i)



✓

Reas 6

(ii) $e + 1 = e^x + 1$

$e = e^x$

∴ $x = 1$ ✓

$y = e + 1$

(iii) $V = \pi\int_0^1 (e+1)^2\,dx - \pi\int_0^1 (e^x+1)^2\,dx$ ✓

$= \pi\left[(e+1)^2 x\right]_0^1 - \pi\int_0^1 e^{2x} + 2e^x + 1\,dx$ ✓

$= \pi(e+1)^2 - \pi\left[\frac{1}{2}e^{2x} + 2e^x + x\right]_0^1$

$= \pi(e+1)^2 - \pi\left[\left(\frac{1}{2}e^2 + 2e + 1\right) - \left(\frac{1}{2} + 2 + 0\right)\right]$ ✓

$= \pi\left(e^2 + 2e + 1 - \frac{1}{2}e^2 - 2e + \frac{3}{2}\right)$

$= \pi\left(\frac{1}{2}e^2 + \frac{5}{2}\right) = \frac{\pi}{2}(e^2 + 5)\ u^3$ ✓

2001

QUESTION 10: (12 marks)

(a) (i) $x = 2 + 2\sin\frac{\pi}{4} \times 0$

$\therefore x = 2.$ ✓

(ii) $v = \frac{\pi}{4} \times 2\cos\frac{\pi}{4}t$

$= \frac{\pi}{2}\cos\frac{\pi}{4}t$ ✓

when $t = 1$, $v = \frac{\pi}{2}\cos\pi/4$

$= \frac{\pi}{2} \times \frac{1}{\sqrt{2}}$

$= \frac{\pi}{2\sqrt{2}}$ $\left(\text{or } \frac{\sqrt{2}\pi}{4}\right)$ ✓

Calc 5

(iii) Stationary $\Rightarrow v = 0$

$0 = \frac{\pi}{2}\cos\frac{\pi}{4}t$

$\therefore 0 = \cos\pi/4\, t$ ✓

$\therefore \frac{\pi}{4}t = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \ldots$

$\therefore t = 2, 6, 10, \ldots$

$\therefore$ Stationary for the second time at $t = 6$. ✓

(b)

(i)

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

✓

(ii) P(even, closer to 5) = $\frac{1}{2}$ ✓

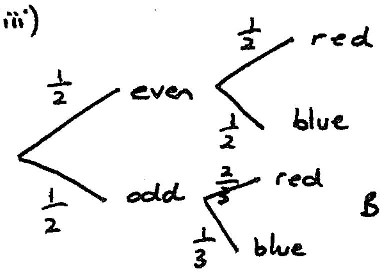
P(even, closer to 10) = $\frac{1}{2}$ ✓

P(odd, closer to 5) = $\frac{2}{3}$ ✓

P(odd, closer to 10) = $\frac{1}{3}$ ✓

Reas 4

(iii)



A removes B

B removes A

✓✓

$\therefore$ Game is not fair.

Player A has a much higher chance of removing 18 blue counters ($\frac{1}{4}$ each time) than Player B ($\frac{1}{6}$ each time)

Com 2

PROFILES

Reasoning

Q 2 (g) – 2
Q 3 (d) – 2
Q 7 (b) – 3
Q 8 (b) (iii) – 2
Q 9 (b) – 6
Q 10 (b) (ii) – 4

/19

Calc

Q 3 (b)+(c) – 8
Q 5 (c) – 7
Q 9 (a) – 6
Q 10 (a) – 5

/26

Com

Q 1 (f) – 2
Q 4 (a) – 3
Q 6 (b) – 3
Q 8 (c) – 2
Q 10 (b) (iii) – 2

/12