BAULKHAM HILLS HIGH SCHOOL

TRIAL 2012

YEAR 12 TASK 4

Mathematics

General Instructions

- Reading time – 5 minutes
- Working time – 120 minutes
- Write using black or blue pen
- Board-approved calculators may be used
- Show all necessary working in Questions 11-16
- Marks may be deducted for careless or badly arranged work

Total marks – 100

Exam consists of 7 pages.

This paper consists of TWO sections.

Section 1 – Page 2 (10 marks)
Questions 1-10

- Attempt Question 1-10

Section II – Pages 3-6 (90 marks)

- Attempt questions 11-16

Table of Standard Integrals is on page 7

STANDARD INTEGRALS

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

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

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

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

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

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

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

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

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

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

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

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

Section I - 10 marks

Use the multiple choice answer sheet for question 1-10

1. $x^3 + 27 =$

(A) $(x+3)(x^2+6x+9)$ (B) $(x+3)(x^2-6x+9)$
(C) $(x+3)(x^2+3x+9)$ (D) $(x+3)(x^2-3x+9)$

2. What is the exact value of $\cos\frac{7\pi}{6}$

(A) $\frac{\sqrt{3}}{2}$ (B) $-\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) $-\frac{1}{2}$

3. For the quadratic equation $y = ax^2 + bx + c$, if $\Delta > 0$ and $a > 0$ then the parabola is

(A) indefinite (B) negative definite (C) positive definite (D) has one root

4. $e^{2\log_e x}$ is equal to

(A) $\sqrt{x}$ (B) x^2 (C) $2x$ (D) e^{2x}

5. $\int_{-2}^{2} 3x - 5\, dx =$

(A) 10 (B) -10 (C) 20 (D) -20

6. The following table list the values of a function $y = f(x)$ for 3 values of x

x	1.2	1.3	1.4
y	3	3.8	4.2

By using the Simpsons rule and these values, the best estimation of $\int_{1.2}^{1.4} f(x)\,dx$ is .

(A) 0.75 (B) 1.12 (C) 1.49 (D) 2.24

7. If $f(x) = a^x + a^{-x}$, then $f^2(x) =$

(A) $1 - f(2x)$ (B) $1 + f(2x)$ (C) $2 - f(2x)$ (D) $2 + f(2x)$

8. For the geometric series $a(m+1) + a(m+1)^2 + a(m+1)^3 + \cdots$ to have a limiting sum
The condition is:-

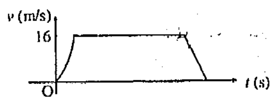
(A) $-1 < m < 1$ (B) $-2 < m < 2$ (C) $-2 < m < 0$ (D) $0 < m < 2$

9. A particle, initially at rest at the origin, moves in a straight line with velocity $V = 6 - 2t\ m/s$. To the nearest metre, the total distance travelled in the first 6 seconds is

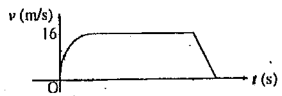
(A) $0m$ (B) $6m$ (C) $9m$ (D) $18m$

10. A van starts from a check point, accelerating initially at $4\ m/s^2$ but with the acceleration decreasing until a maximum speed of $16\ m/s$ is attained. It continues at $16\ m/s$ for some time, then slows with a constant deceleration until it comes to rest.
Which one of the following graphs best represents the motion of the van?

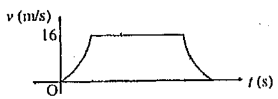
(A)



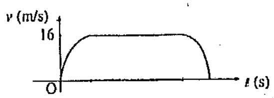
(B)



(C)



(D)



End of Section 1

Section II – Extended Response

Attempt questions 11-16.
Answer each question on a SEPARATE PAGE. Clearly indicate question number.
Each piece of paper must show your name.
All necessary working should be shown in every question.

Question 11 (15 marks) — Marks

a) Express 63° in radians to 3 significant figures — **2**

b) Sketch the curve $y = \log_e x$. State its domain and range. — **3**

c) Given $(3+\sqrt{2})^2 = a + \sqrt{b}$
Find a and b. — **2**

d) Solve for x
$|x - 3| = 2$ — **2**

e) Find the vertex and focus of
$$(x+2)^2 = -12y + 6$$ — **2**

f) A ship sails from a Port A 50 nautical miles due east to a Port B.
It then proceeds a distance of 30 nautical miles on a bearing of $020°T$ to Port C
(i) Find the distance of Port C from Port A (correct to 2 decimal places) — **2**
(ii) Find the true bearing of Port C from Port A — **2**

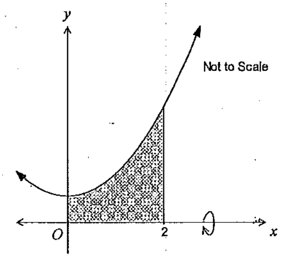
Question 12 (15 marks)

a) In your number booklet, plot the points $A(-2,1)$, $B(3,3)$, $C(2,6)$ and $D(-3,4)$ on a number plane.
(i) Show that the equation of AB is $2x - 5y + 9 = 0$ — **2**
(ii) Find the exact perpendicular distance from the point C to the line AB — **2**
(iii) Hence find the area of the parallelogram $ABCD$ — **2**

b) An arc length 7 units subtends an angle θ at the centre of a circle of radius 3 units.
Find the value of θ to the nearest degree. — **2**

c) Differentiate the following functions with respect to x
(i) $\cos 5x$ — **2**
(ii) $e^x \ln x$ — **2**

d)



The shaded region in the diagram is bounded by the curve $y = x^2 + 2$, the x-axis, and the lines $x = 0$ and $x = 2$. — **3**

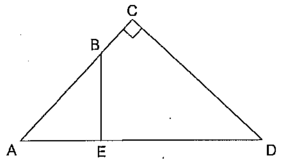
Find the volume of the solid of revolution formed when the shaded region is rotated about the x-axis.

Question 13 (15 marks)

Marks

a) Find the equation of the tangent to the curve $y = x^4 - 4$ at the point $(1, -3)$ **2**

b)



Given $BE = 3$ units, $AE = 4$ units and $AB = 5$ units and $CD = 7$ units.

Copy the diagram in your booklet:

(i) Prove that ΔABE is similar to ΔADC. **2**

(ii) Find the exact length of BC. **1**

c) A bottle of solvent is open and the solvent evaporates in such a way that the amount remaining, $V\ ml$, in the bottle is given by $V = 1500e^{-0.003t}$, where t is time in hours.

(i) How long is it before half the initial amount of solvent has evaporated from the bottle? **1**

(ii) If the solvent continues to evaporate will the bottle ever become empty? Explain. **2**

d) If α and β are the roots of the quadratic equation $\frac{1}{x} = x + p$,

(i) Show that the quadratic equation can be written as $x^2 + px - 1 = 0$ **1**

Find in terms of p:-

(ii) $\alpha + \beta$ **1**

(iii) $\alpha\beta$ **1**

(iv) $2\alpha^2 + 2\beta^2$ **2**

e) The acceleration of a moving body is given by $a = \sqrt{2t+1}\ ms^{-2}$. **2**

If the body starts from rest, find its velocity after 4 seconds.

Question 14 (15 marks)

a) Given that

$$f(x) = \begin{cases} 2 & for\ x < -1 \\ 6x - x^2 & for\ x \geq 0 \end{cases}$$

(i) Find the value of $f(f(-1.1))$ **2**

(ii) Find the vertex for the equation $y = 6x - x^2$ **1**

(iii) Graph $y = f(x)$, clearly showing all important features. **3**

(iv) Hence or otherwise, solve for $f(x) = 2$, leaving your answer in exact form. **2**

b) Solve for x for $0 \leq x \leq 2\pi$ **3**

$$2\sin^2 x = 3(\cos x + 1)$$

c) Explain why the curve $y = \frac{3x+5}{x+1}$ is always decreasing for all real values of x except $x = -1$ **2**

d) Simplify **2**

$$\sum_{x=13}^{14} (ax+2)^{x-13}$$

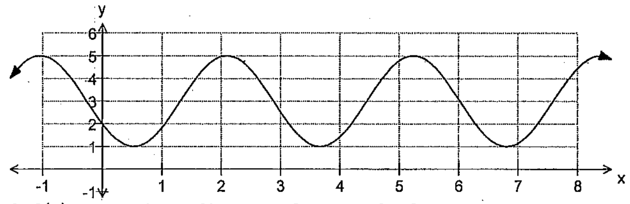
Question 15 (15 marks)

Marks

a) It is given that $f(x) = -f(-x)$, where $f(x)$ is continuous. **2**

Find the value of $\int_{-5}^{5} f(x)dx$ and justify your answer.

b)



The graph $f(x) = a\sin(2x + b) + 3$ is shown in the diagram :

(i) State the period. **1**

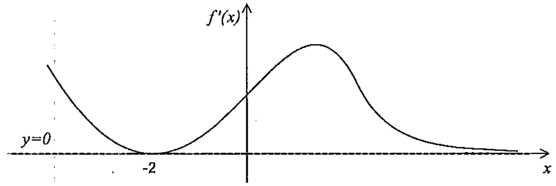
(ii) Find the values of a and b. **2**

(iii) How many solutions are there for $a\sin(2x + b) + 3 = 0.5x + 1$ **1**

c) For the graph $y = f(x)$, it is given that $f(-2) = 0, f(0) = 2$ and $f(x) < 3$ **2**

Below is a graph of $y = f'(x)$.

Draw a possible graph for $y = f(x)$ showing information known.



d) A dealership offers Ashwin \$20000 loan for a new car at the beginning of the year for which it charges interest at the rate of 6%pa.

(i) Ashwin wants to make monthly repayments at the end of the month and pay it off in 5 years.

Let M be Ashwin's repayments

(α) Show that the balance of Ashwin's account at the end of the 2nd month is **1**

$A_2 = 20000 \times 1.005^2 - 1.005M - M$

(β) Find an expression for the amount owed at the end of the 5 years and deduce that **2**

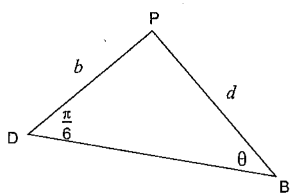
$$M = \frac{0.005(20000 \times 1.005^{60})}{1.005^{60} - 1} = \$387\ (to\ the\ nearest\ dollar)$$

(γ) Show that at the end of the first year Ashwin will owe the dealership \$16460 (to the nearest ten dollars) **1**

(ii) At the beginning of the 2nd year, Ashwin's mother decides to secretly make \$101 repayments at the beginning of the month to help him pay it off earlier.

How many payments did Ashwin's mother have to make until it was paid off? **3**

Question 16 (15 marks)	Marks
a) If $a = \log_{\frac{1}{x}} \frac{1}{N}$ such that $x > 0$ and $N > 0$, show that $a = \log_x N$	2
b) The sum of a series is given as $S_n = n^2 - 3^n$.	
(i) Find S_{12}, leaving your answer in 2 decimal places.	1
(ii) Find the 12^{th} term of the series in 2 decimal places.	2
c) (i) Show that $\frac{d}{dx}(\sec x) = \sec x \tan x$	2
(ii) Show that $\frac{d}{dx}(\sec x + \tan x) = \sec x\,(\sec x + \tan x)$	1
(iii) Hence, or otherwise, evaluate $$\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \sec x \, dx$$	3
d) The triangle PDB with fixed side lengths b and d is given below.	



(i) Show that the area, A, of a triangle DBP is given by $A = \frac{1}{2} db \sin\left(\frac{5\pi}{6} - \theta\right)$.	1
(ii) Hence prove that the maximum area of the triangle occurs when $b = \sqrt{3}d$	3

End of Exam

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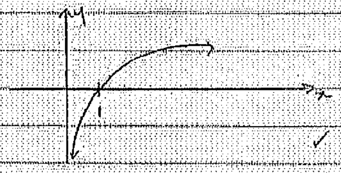
Question 11

a) $63^\circ \times \frac{\pi}{180^\circ} = 1.09955\ldots$ ✓

$= 1.10$ (3sig fig) ✓

b)



✓

Domain: $x > 0$ ✓

Range: all real y ✓

c) $(3+\sqrt{2})^2 = 3^2 + 6\sqrt{2} + 2$

$= 11 + 6\sqrt{2}$

$= 11 + \sqrt{72}$ ✓

$\therefore \underbrace{a = 11 \quad b = 72}$ ✓

d) $x - 3 = 2$ or $x - 3 = -2$

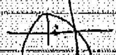
$x = 1$ or 5

✓ ✓

e) $(x+2)^2 = -12(y - \frac{1}{2})$

$4a = -12$

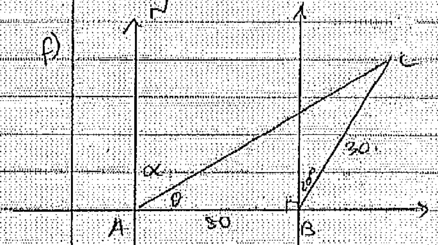
$a = -3$



vertex $(-2, \frac{1}{2})$

focus $(-2, -2\frac{1}{2})$ ✓

f)



MC	1	2	3	4	5	6	7	8	9	10
Answer	D	B	A	B	D	A	D	C	D	B

(i) $d^2 = 50^2 + 30^2 - 2\times 50 \times 30 \cos 110^\circ$ ✓

$d = 66.528\ldots$

$d = 66.53$ ✓

must be in degrees on calc

(ii) $\frac{\sin\theta}{30} = \frac{\sin 110^\circ}{66.5286}$

$\theta = 25.07$ ✓

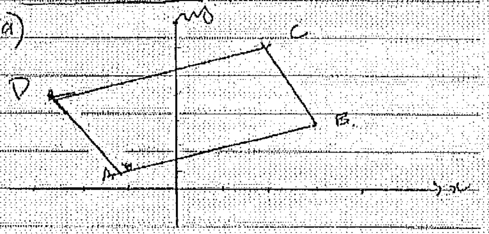
$\alpha = 90 - 27.07$

$= 64.929$

$\therefore$ Bearing $= 065^\circ T$ ✓

QUESTION 12

a)



(i) $m_{AB} = \frac{3-1}{3+2} = \frac{2}{5}$ ✓

$y - 3 = \frac{2}{5}(x - 3)$ ✓

$5y - 15 = 2x - 6$

$2x - 5y + 9 = 0$

(ii) $d = \frac{|2(2) - 5(6) + 9|}{\sqrt{2^2 + 5^2}}$ ✓

$d = \frac{17}{\sqrt{29}}$ ✓

Question 12 (cont)

a)(iii) $AB = \sqrt{(3-1)^2 + (3+2)^2}$

$= \sqrt{29}$ ✓

Area $= \frac{17}{\sqrt{29}} \times \sqrt{29}$

$= 17$ units^2 ✓

b) $3\theta = 7$

$\theta = \frac{7}{3}$ radians ✓

$\theta = 134^\circ$ ✓

OR

$7 = 2\pi \times 3 \times \frac{\theta}{360}$ ✓

$\theta = 134^\circ$ ✓

c) i) $\frac{d}{dx}\cos 5x = \underbrace{-5}_{✓}\ \underbrace{\sin 5x}_{✓}$

ii) $u = e^x \qquad v = \ln x$

$u' = e^x \qquad v' = \frac{1}{x}$

$\frac{d}{dx} e^x \ln x = \underbrace{e^x \ln x}_{✓} + \underbrace{\frac{e^x}{x}}_{✓}$

d) $V = \pi \int_0^2 (x^2+2)^2\,dx$ ✓

$V = \pi \int_0^2 x^4 + 4x^2 + 4\,dx$

$= \pi \left[\frac{x^5}{5} + \frac{4x^3}{3} + 4x\right]_0^2$ ✓

$= \pi\left(\left[\frac{2^5}{5} + \frac{4\times 2^3}{3} + 4\times 2\right] - [0]\right)$

$= \frac{376\pi}{15} = 78.75$ ✓

Question 13

a) $y = x^4 - 4$

$\frac{dy}{dx} = 4x^3$

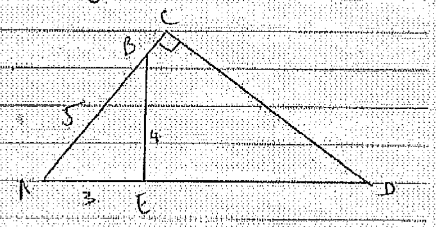
at $x = 1 \quad m_T = 4 \times 1$

$= 4$

$y + 3 = 4(x - 1)$

$y = 4x - 7$

b)



$\triangle ABE$ is right angled triangle

(3,4,5 pythagorean triad)

$\therefore \angle AEB = 90^\circ$ ✓

In $\triangle ABE$ & $\triangle ADC$

$\angle BEA = \angle ACD = 90^\circ$

$\angle CAD$ is common

$\therefore \triangle ABE \,|||\, \triangle ADC$ (AA) ✓

ii) $\frac{AC}{AE} = \frac{CD}{BE}$ (matching sides of similar $\triangle$'s in ratio)

$\frac{BC + 5}{4} = \frac{7}{3}$

$BC = \frac{13}{3}$ ✓

Question 13 (cont)

c) i) $V = 1500 e^{-0.003t}$

when $t = 0$, $V = 1500$

$750 = 1500 e^{-0.003t}$

$\frac{1}{2} = e^{-0.003t}$

$\frac{\log_e(0.5)}{-0.003} = \frac{-0.003t}{-0.003}$

$t = 231.049$ hrs

(3dp)

(ii) $\lim_{t \to \infty} 1500 e^{-0.003t}$

$\to 0$ but never $= 0$

Since $V = 0$ is the asymptote

∴ it will never be empty

d) i) $\frac{1}{x} = x + p$

$1 = x^2 + px$

$x^2 + px - 1 = 0$

ii) $\alpha + \beta = \frac{-b}{a} = -p$

iii) $\alpha\beta = -1$

iv) $2(\alpha^2 + \beta^2 + 2\alpha\beta - 2\alpha\beta)$

$= 2[(\alpha+\beta)^2 - 2\alpha\beta]$

$= 2[(-p)^2 - 2(-1)]$

$= 2p^2 + 4$

e) $v = \int (2t+1)^{\frac{1}{2}}\, dt$

$v = \frac{2(2t+1)^{\frac{3}{2}}}{3 \times 2} + c$

at $t = 0$ $v = 0$.

$0 = \frac{1}{3} + c$

$c = -\frac{1}{3}$

$v = \frac{1}{3}(2t+1)^{\frac{3}{2}} - \frac{1}{3}$

$v = 9 - \frac{1}{3}$

$v = \frac{26}{3}\ \text{ms}^{-1}$

Question 14

(i) $f(-1.1) = 2$

$f(f(-1.1)) = f(2)$

$= 6(2) - (2)^2$

$= 8$

(ii) axis of sym ⇒ $x = \frac{-6}{2 \times -1} = +3$

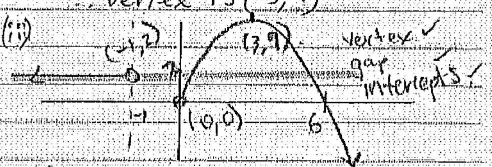
when $x = 3$

$y = -3^2 + 6 \times 3$

$y = 9$

∴ vertex is $(3, 9)$

(iii)



$6x - x^2 = 2$

$x^2 - 6x + 2 = 0$

$x = \frac{6 \pm \sqrt{28}}{2}$

$x = 3 \pm \sqrt{7}$ or $x < -1$

Question 14

b) $2(1 - \cos^2 x) = 3\cos x + 3$

$2\cos^2 x + 3\cos x + 1 = 0$

$(2\cos x + 1)(\cos x + 1) = 0$

$\cos x = -\frac{1}{2}$ or $\cos x = -1$

Acute ∠ $= \frac{\pi}{3}$

∴ $x = \frac{2\pi}{3}, \frac{4\pi}{3}$ or π

c) $u = 3x + 5$ $v = x + 1$

$u' = 3$ $v' = 1$

$\frac{dy}{dx} = \frac{3(x+1) - (3x+5)}{(x+1)^2}$

$= \frac{-2}{(x+1)^2}$

Since $(x+1)^2 \geq 0$

and $\frac{-2}{(x+1)^2} < 0$ except $x \neq -1$

d) $\sum_{x=13}^{14} (ax+2)^{x-13}$

$= (13a+2)^0 + (14a+2)^1$

$= 14a + 3$

Question 15

a) $\int_{-5}^{5} f(x) = 0$

Since $f(x)$ is an odd function, the area above cancels with area below.

b) (i) period $= \frac{2\pi}{2} = \pi$

(ii) $a = 2$

$2 = 2\sin(2(0) + b) + 3$

$-\frac{1}{2} = \sin b$

$b = -\frac{\pi}{6}$

OR

$a = -2$

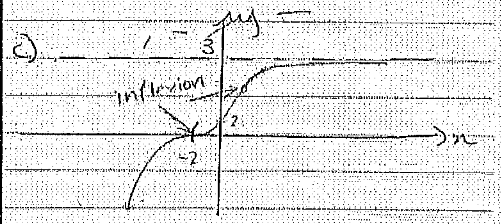
$2 = -2\sin b + 3$

$\frac{+1}{2} = \sin b$

$b = \frac{\pi}{6}$

(iii) 5 solns.

c)



d) $P = 20000$ $R = 0.06$ pa $n = 5$ yrs

$R = 0.005$ per month $n = 60$ month

(α) $A_1 = 20000 \times 1.005 - M$

$A_2 = 20000 \times 1.005^2 - 1.005M - M$

(β) $A_{60} = 20000 \times 1.005^{60} - 1.005^{59} M - \ldots - M$

$0 = 20000 \times 1.005^{60} - M(1.005^{59} + \ldots + 1)$

GP $a = 1$, $r = 1.005$ $n = 60$

$20000 \times 1.005^{60} = M\left[\frac{1(1.005^{60} - 1)}{1.005 - 1}\right]$

$0.005(20000 \times 1.005^{60}) = M(1.005^{60} - 1)$

∴ $M = \frac{0.005(20000 \times 1.005^{60})}{1.005^{60} - 1}$

$= \$387$

Question 15

r) $A_{12} = 20000 \times 1.005^{12} - 387\left(\frac{1.005^{12}-1}{1.005-1}\right)$

$A_{12} = \$16459.693$

$A_{12} = \$16460$ ✓

(ii) see last page

Question 16

a) $a = \log_{\frac{1}{x}} \frac{1}{N}$

$\left(\frac{1}{x}\right)^a = \frac{1}{N}$

$\frac{1}{x^a} = \frac{1}{N}$ ✓

$x^a = N$

$\therefore a = \log_x N$ ✓

b) (i) $S_{12} = 12^2 - 3^{12}$

$= -531297$ ✓

(ii) $T_{12} = S_{12} - S_{11}$

$S_{11} = 11^2 - (3)^{12}$

$= -177026$ ✓

$\therefore T_{12} = -531297 - (-177026)$

$= -354271$ ✓

c) i) $\frac{d}{dx}(\cos x)^{-1} = -(\cos x)^{-2} \times -\sin x$ ✓

$= \frac{\sin x}{\cos^2 x}$ ✓

$= \sec x \tan x$

ii) $\frac{d}{dx}(\sec x + \tan x)$

$= \sec x \tan x + \sec^2 x$ ✓

$= \sec x(\tan x + \sec x)$

iii) $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \sec x \times \frac{\tan x + \sec x}{\tan x + \sec x}\, dx$

$= \left[\ln(\tan x + \sec x)\right]_{\frac{\pi}{6}}^{\frac{\pi}{3}}$ ✓

$= \ln(\tan\frac{\pi}{3} + \sec\frac{\pi}{3}) - \ln(\tan\frac{\pi}{6} + \sec\frac{\pi}{6})$

$= \ln(\sqrt{3}+1) - \ln\left(\frac{1}{\sqrt{3}} + \frac{2}{\sqrt{3}}\right)$ ✓

$= \ln(\sqrt{3}+1) - \ln\left(\frac{3}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}\right)$

$= \ln(\sqrt{3}+1) - \ln(\sqrt{3})$ ✓

$= \ln\left(\frac{\sqrt{3}+1}{\sqrt{3}}\right)$

$= 0.767651$ –

d)(i) $\angle DPB = \pi - \frac{\pi}{6} - \theta$

$= \frac{5\pi}{6} - \theta$ ✓

$\therefore A = \frac{1}{2} \times bd \sin(\frac{5\pi}{6} - \theta)$

ii) $\frac{dA}{d\theta} = -\frac{1}{2} bd \cos(\frac{5\pi}{6} - \theta)$

Stat pt when $\frac{dA}{d\theta} = 0$

$0 = -\frac{1}{2} bd \cos(\frac{5\pi}{6} - \theta)$

$\cos(\frac{5\pi}{6} - \theta) = 0$

$\frac{5\pi}{6} - \theta = \frac{\pi}{2}$ ✓

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

Question 16 (cont)

16d(ii) $\frac{d^2A}{d\theta^2} = -\frac{1}{2} bd \sin(\frac{5\pi}{6} - \theta)$

when $\theta = \frac{\pi}{3}$

$\frac{d^2A}{d\theta^2} = -\frac{1}{2} bd \sin(\frac{\pi}{2})$

$= -\frac{1}{2} bd$

Since $bd > 0$ then ✓

$\frac{d^2A}{d\theta^2} < 0$

$\therefore$ max at $\theta = \frac{\pi}{3}$

$\therefore \frac{b}{\sin(\frac{\pi}{3})} = \frac{d}{\sin(\frac{\pi}{6})}$ ✓

$\frac{b}{2 \times (\frac{\sqrt{3}}{2})} = \frac{d}{(\frac{1}{2}) \times 2}$

$\frac{b}{\sqrt{3}} = \frac{d}{1}$

$b = d\sqrt{3}$

Question 15 (cont)

d) ii) $A_1 = 16460 \times 1.005 - 101 \times 1.005 - 387$ OR $A_1 = (16460 - 101) \times 1.005 - 387$

$A_2 = 16460 \times 1.005^2 - 101 \times 1.005^2 - 1.01 \times 1.005 - 387 \times 1.005 - 387$

⋮

$A_n = 16460 \times 1.005^n - 101 \times 1.005^n - 101 \times 1.005^{n-1} - \dots - 101 \times 1.005 - 387 \times 1.005^{n-1} - \dots - 387$

$0 = 16460 \times 1.005^n - 101(1.005^n + 1.005^{n-1} + \dots + 1.005) - 387(1.005^{n-1} + 1.005^{n-2} + \dots + 1)$ ✓

$0 = 16460 \times 1.005^n - 101\left[\frac{1.005(1.005^n - 1)}{1.005 - 1}\right] - 387\left[\frac{1(1.005^n - 1)}{1.005 - 1}\right]$ ✓

$0 = 16460 \times 1.005^n - 20301(1.005^n - 1) - 77400(1.005^n - 1)$

$0 = 16460 \times 1.005^n - 97701(1.005^n - 1)$

$0 = 16460 \times 1.005^n - 97701 \times 1.005^n + 97701$

$-97701 = -81241 \times 1.005^n$

$\frac{97701}{81241} = 1.005^n$

$n = \log_{1.005}\left(\frac{97701}{81241}\right)$ ✓

$n = 36.99\dots$

$\therefore$ 37 payments