EPPING BOYS' HIGH SCHOOL

YEAR 12 MATHEMATICS (2U)
TRIAL HSC EXAMINATION 2008

Time allowed: 3 hours (Plus 5 minutes reading time)

Student Number: ____

Class: 12M__________ **Teacher:** ____________________________

DIRECTIONS TO CANDIDATES:

- There are 10 questions.
- **ALL** questions must be attempted.
- **ALL** questions are of equal value.
- **Write using black or blue pen.**
- All necessary working should be shown in every question.
- Full marks may not be given unless you show working.
- Full marks may not be awarded for careless or badly arranged work.
- **Start each question in a new booklet.**
- Approved calculators may be used.
- **Do not** use white out on your answer paper.
- Cross out neatly leaving deleted work able to read.
- Fill in the information at the top of this page.
- Borrowing is not allowed.
- A table of standard integrals is provided at the back of this paper.

1	2	3	4	5	6	7	8	9	10	Total	%
12	12	12	12	12	12	12	12	12	12	/120	100

Total Marks – 120
Attempt Questions 1 – 10
All questions are of equal value

Marks

Begin each question on a SEPARATE sheet of paper. Extra paper is available.

Question 1 (12 marks) Use a SEPARATE sheet of paper or booklet.

a) Evaluate $e^{2.4}-1$ correct to 3 significant figures. **2**

b) Solve $|2x-4|\leq 2$ **2**

c) If $\frac{4}{2-\sqrt{3}}=a+b\sqrt{3}$ find the values of *a* and *b*. **2**

d) Find the sum of the first ten terms of the series 4½ + 3 + 1½ + … **2**

e) Factorise $2z^2+6zy+xz+3xy$ **2**

f) Find the perpendicular distance from the point (1, 3) to the line $6x-8y+5=0$ **2**

End of Question 1

Question 2 (12 marks) Use a SEPARATE writing booklet. **Marks**

a) Differentiate with respect to x

(i) $2x^3 + x^{-3}$ **2**

(ii) $\frac{1}{e^{2x}} - \sin x$ **2**

b) (i) Find $\int \sec^2 x - e^{4x} \; dx$ **2**

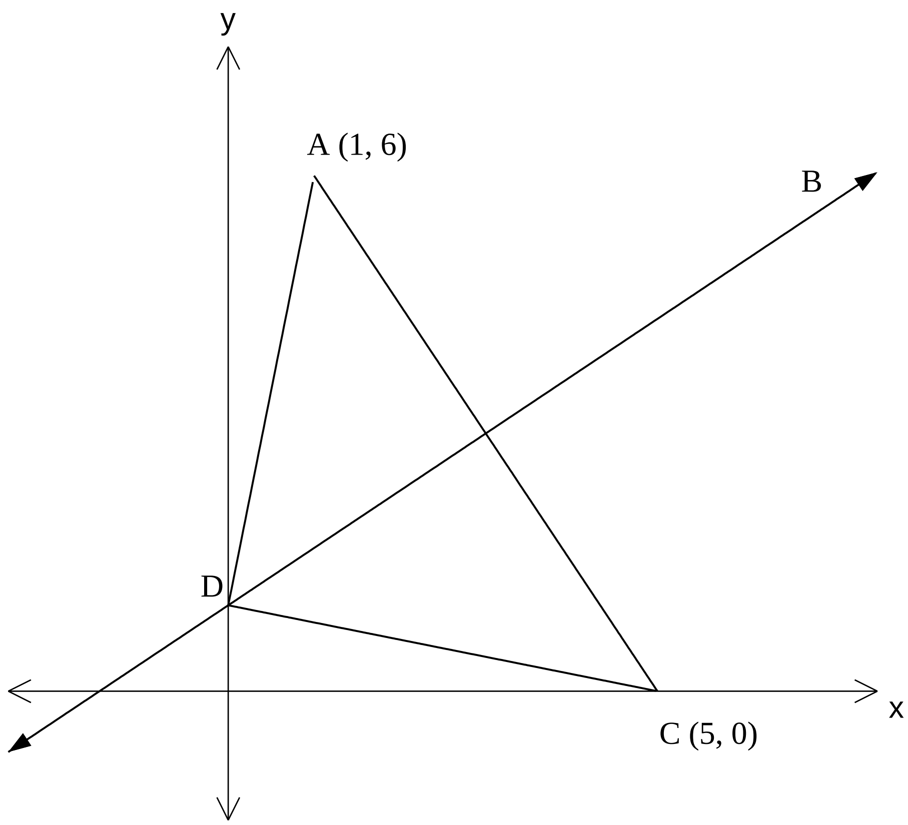
(ii) Evaluate $\int_1^e x^2 + \frac{2}{x} dx$ **3**

c) Find the area enclosed by the curve $y = \cos x$, the line $x = \frac{\pi}{3}$ and the x and y axes. **3**

End of Question 2

Question 3 (12 marks) Use a SEPARATE writing booklet. **Marks**

a)



The points A and C have coordinates (1, 6) and (5, 0) respectively.
The line BD has an equation of $2x-3y+3=0$ and meets the y axis in D.

i) The point M is the midpoint of AC. Show that M has coordinates (3, 3). **1**

ii) Show that M lies on BD. **1**

iii) Find the gradient of the line AC. **1**

iv) Show that BD is perpendicular to AC. **2**

v) Find the distance AC. **1**

vi) Explain why the quadrilateral ABCD is a kite regardless of the position of B. **1**

Question 3 continues on page 5

Question 3 continued **Marks**

(b) i Find the sum of the first 200 positive integers. **2**

$1 + 2 + 3 + 4 + \ldots\ldots. 200$

ii. The series $1 + 5 + 7 + 11 + \ldots\ldots\ldots.. + 199$ is formed by omitting from the first 200 positive integers all those which are multiples of 2 or 3. **3**

Find the sum of the series.

End of Question 3

Question 4 (12 marks) Use a SEPARATE writing booklet. **Marks**

a) Show that: **2**

$$\sqrt{\frac{\operatorname{cosec}^2 x - \cot^2 x - \cos^2 x}{\cos^2 x}} = \tan x$$

b) Express $2{\cdot}12^c$ (radians) as an angle in degrees correct to the nearest minute **1**

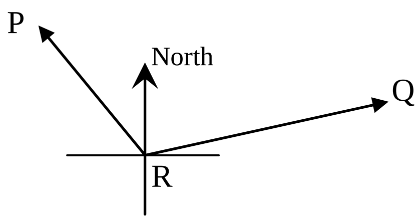
c) What is the domain and range for $y = \sqrt{9 - x^2}$ **2**

d) Ally and Bella are standing on level ground on opposite sides of a tower which is 142 metres high. Ally is due west and measures the angle of elevation of the top of the tower as 16^o. Bella is due east and measures the angle of elevation of the top of the tower as 20^o.

i) Draw a diagram to illustrate this information. **1**

ii) Calculate the distance between Ally and Bella. **2**

e) Peta and Quentin are pilots of two light planes which leave Resthaven station at the same time. Peta flies on a bearing of 330^o at a speed of 180 km/h and Quentin flies on a bearing of 080^o at a speed of 240 km/h. Copy the diagram below onto your answer page and mark the information on the diagram.



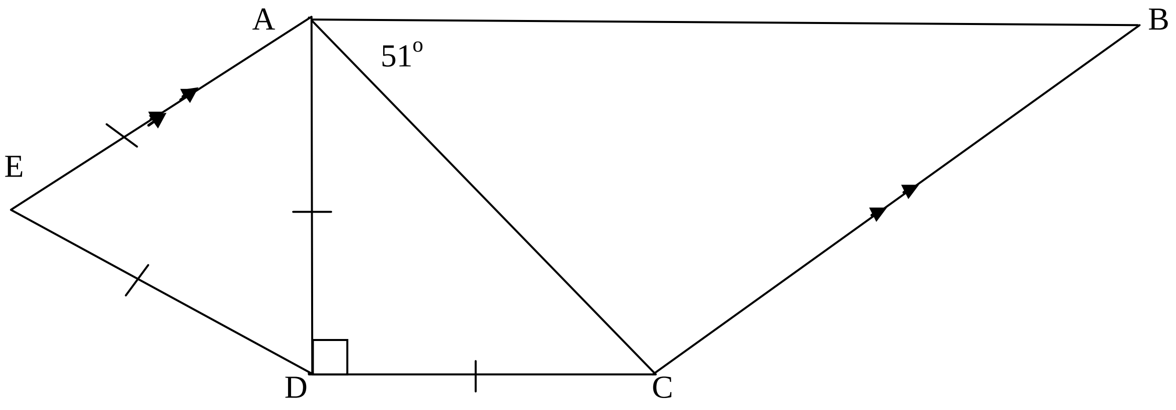
i) How far apart are Peta and Quentin after 2 hours? **2**

ii) What is the bearing of Quentin from Peta after 2 hours. **2**

End of Question 4

Question 5 (12 marks) Use a SEPARATE writing booklet. **Marks**

a) In the diagram below AE = ED = AD = DC, $\angle ADC = 90^\circ$ and AE || BC.
$\angle BAC = 51^\circ$

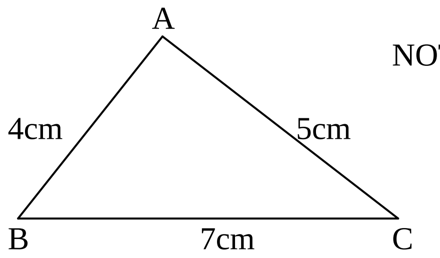


i) Find the size of $\angle EAB$. Give reasons for your answer. **3**

ii) Find the size of $\angle ABC$. Give reasons for your answer. **1**

b) Solve, giving your answer(s) in exact form : $2x^2 - 5x - 4 = 0$. **2**

c) **2**



NOT TO SCALE

In the diagram above, find the size of the largest angle.
Give your answer correct to the nearest degree.

d) Simplify: $\dfrac{5}{m-2} - \dfrac{2}{m-3}$ **2**

e) Solve the pair of simultaneous equations **2**

$$3x - y = 10$$
$$x = y + 2$$

End of Question 5

Question 6 (12 marks) Use a SEPARATE writing booklet. **Marks**

a) For the function $y = x^6 - 6x^4$

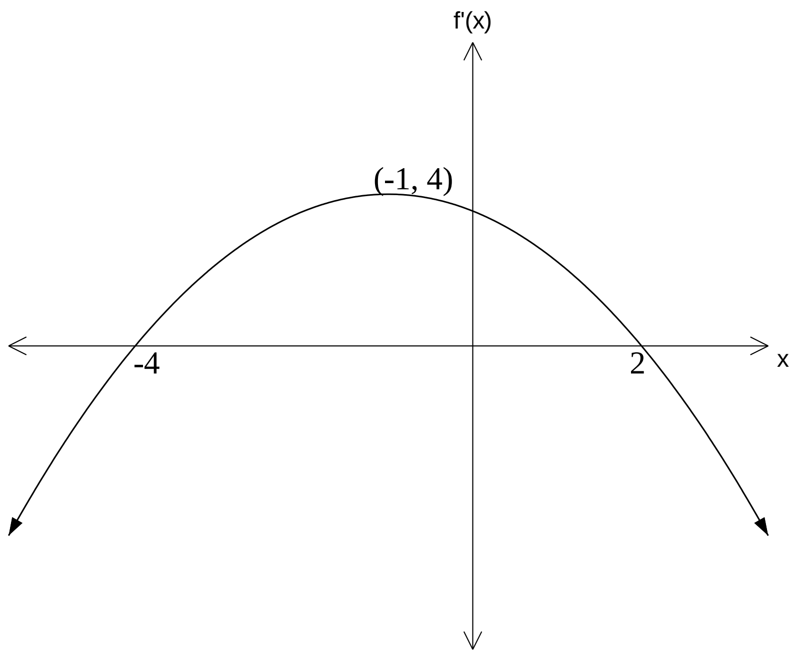
i) Find the x coordinates of the points where the curve crosses the axes. **2**

ii) Find the coordinates of the stationary points and determine their nature. **4**

iii) Find the coordinates of the points of inflexion. **2**

iv) Sketch the graph of $y = x^6 - 6x^4$ indicating clearly the intercepts, stationary points and points of inflexion. **2**

b) For a certain function $y = f\left(x\right)$, the sketch of $y = f'\left(x\right)$ is shown.



Give the x coordinates of the stationary points on $y = f\left(x\right)$ and indicate if they are maxima or minima. **2**

End of Question 6

Question 7 (12 marks) Use a SEPARATE writing booklet. **Marks**

a) For the parabola with equation $x^2 = -8y$.

i) Find the coordinates of the focus (S) of the parabola. **1**

ii) Find the equation of the directrix of the parabola. **1**

iii) Show that the point A(-8, -8) lies on the parabola. **1**

iv) Find the equation of the focal chord of the parabola which passes through A. **2**

v) Find the equation of the tangent to the parabola at A. **2**

b) i) Show that the curves $y = x^2 - 3x$ and $y = 5x - x^2$ intersect at the points (0, 0) and (4, 4). **2**

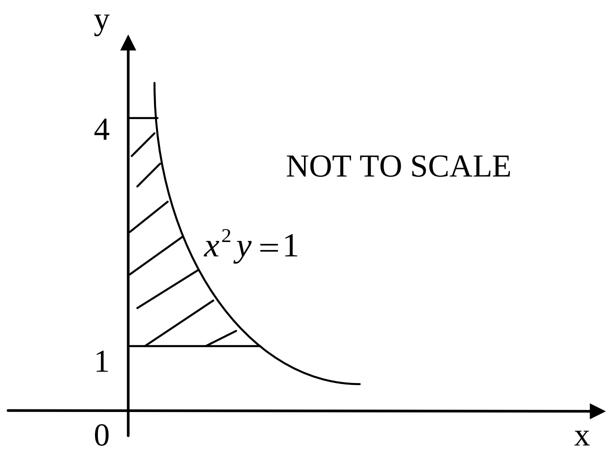
ii) Find the area enclosed between the two curves. **3**

End of Question 7

Question 8 (12 marks) Use a SEPARATE writing booklet.

Marks

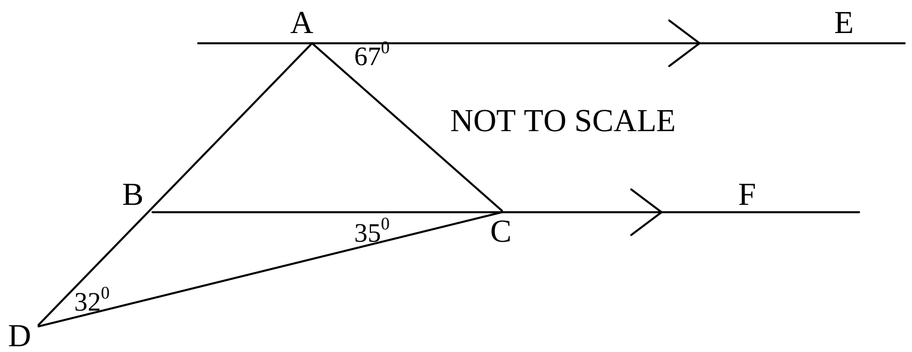
a)



The shaded region above shows the area bounded by the graph $x^2y = 1$, $(x > 0)$, the y-axis and the lines $y = 1$ and $y = 4$.
Find the volume of the solid of revolution formed when the shaded region is rotated about y-axis. Give your answers in exact form. **4**

b) Use the change of base rule to evaluate $\log_8 4$. **1**

c)



In the diagram above AE is parallel to BF.
$\angle ADC = 32^0$, $\angle BCD = 35^0$ and $\angle CAE = 67^0$

i) Show that ΔABC is isosceles. **3**

ii) Find the size of $\angle BAC$. **1**

Question 8 continues on page 11

Question 8 continued **Marks**

d) Find an approximation for $\int_1^3 g(x)\,dx$ by using Simpson's Rule with the values in the table below. **2**

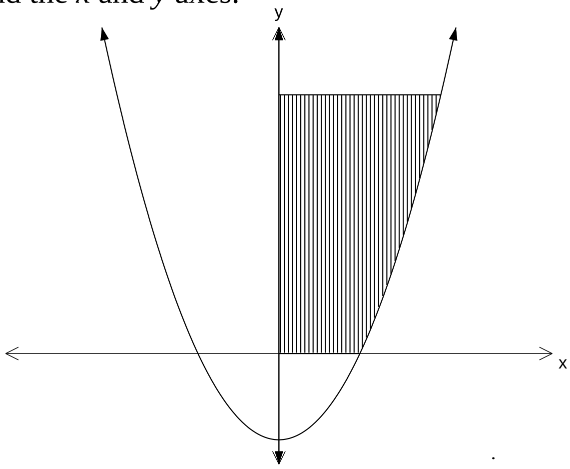
x	1	1.5	2	2.5	3
$g(x)$	12	8	0	3	5

e) Evaluate $\sum_{n=2}^{5} n^2 - 1$ **1**

End of Question 8

Question 9 (12 marks) Use a SEPARATE writing booklet. **Marks**

a) The diagram shows the region bounded by the curve $y = 2x^2 - 2$ the line $y = 6$ and the x and y axes. **3**



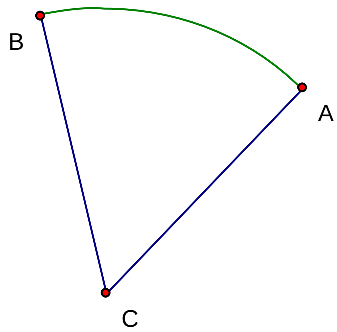
Find the volume of the solid of revolution formed when the region is rotated about the y axis.

b)

The sector ABC has r = 5cm **1**

and the arc length BA = 5cm.

Calculate the area of the sector.



c) Find the equation of the tangent to $y = 2e^x$ at the point (0, 2). **2**

d) Bernice contributes to a superannuation fund. She contributes \$250 at the start of every quarter. The investment pays 8%pa interest, compounding quarterly. She continues making contributions for 30 years.

(i) How much does she contribute altogether? **1**

(ii) What is the value of her initial \$250 investment at the end of the 30 years? **1**

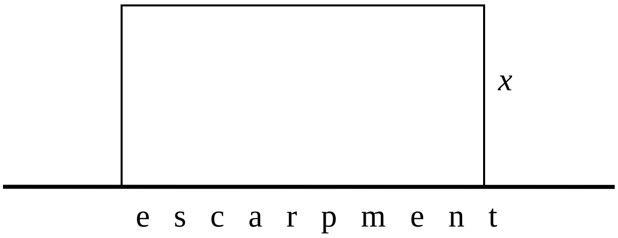
(iii) Find the total value of her superannuation. **3**

(iv) How much of her superannuation lump sum is interest? **1**

End of Question 9

Question 10 (12 marks) Use a SEPARATE writing booklet. **Marks**

a) A farmer wishes to build a rectangular enclosure for his sheep.
Fortunately he can use a sandstone escarpment as one side of his rectangle.



He has sufficient fencing material for 200m of fence.

(i) If we let one side of the rectangle be x, write an expression for the area of the enclosure in terms of x. **2**

(ii) Find the maximum area enclosure the farmer can build. **3**
Be sure to justify that this area is a maximum.

b) Consider the parabola $2y = x^2 - 4x$.

i) Rewrite it in the form $4a(y-k) = (x-h)^2$ **2**

ii) Give the coordinates of the focus. **1**

iii) Give the equation of the directrix. **1**

c) (i) Find $\int \cos(4x)dx$ **1**

(ii) Evaluate $\int_1^{e^4} \frac{x}{x^2+4}dx$ **2**

End of Examination

STANDARD INTEGRALS

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

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

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

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

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

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

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

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

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

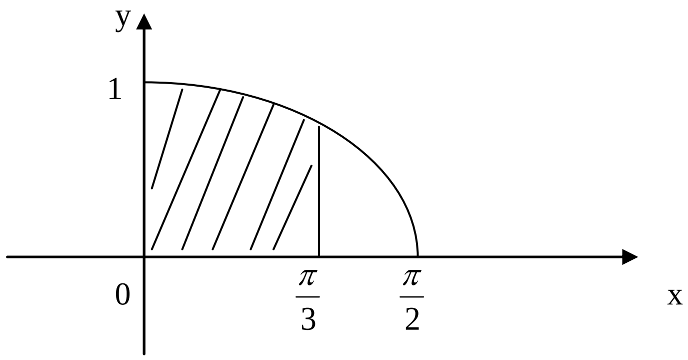
$$\int \frac{1}{\sqrt{x^2 - a^2}}\,dx = \ln\left(x + \sqrt{x^2 - a^2}\right), \quad x > a > 0$$

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

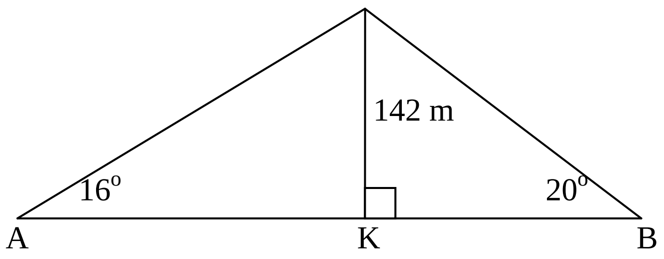
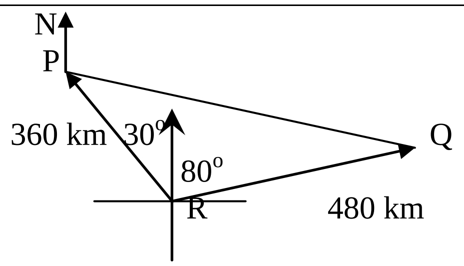
NOTE : $\ln x = \log_e x, \quad x > 0$

EPPING BOYS' HIGH SCHOOL
YEAR 12 MATHEMATICS (2U)
2008 TRIAL HSC EXAMINATION
SOLUTIONS

Question 1	Trial HSC Examination- Mathematics	
Part	**Solution**	**Marks**
(a)	$e^{2.4}-1\approx 10.023\approx 10.0$ (3 sig fig)	2
(b)	$\|2x-4\|\le 2$ $-2\le 2x-4\le 2$ $2\le 2x\le 6$ $1\le x\le 3$	2
(c)	$\frac{4}{2-\sqrt{3}}=a+b\sqrt{3}$ $\frac{4}{2-\sqrt{3}}=\frac{4}{2-\sqrt{3}}\times\frac{2+\sqrt{3}}{2+\sqrt{3}}$ $=\frac{8+4\sqrt{3}}{4-3}$ $a+b\sqrt{3}=8+4\sqrt{3}$ $a=8$ and $b=4$	2
(d)	4½ + 3 + 1½ + … Series is arithmetic with $a=4\frac{1}{2}$ and $d=-1\frac{1}{2}$ $S_n=\frac{n}{2}(2a+(n-1)d)$ $S_{10}=\frac{10}{2}(9+(9)(-1\frac{1}{2}))$ $=5(-4\frac{1}{2})$ $=-22\frac{1}{2}$	2
(e)	$2z^2+6zy+xz+3xy=2z(z+3y)+x(z+3y)$ $=(2z+x)(z+3y)$	2
(f)	$d=\left\|\frac{6(1)-8(3)+5}{\sqrt{6^2+(-8)^2}}\right\|$ $=\left\|\frac{-13}{\sqrt{100}}\right\|$ $=1.3$	2

Question 2	Trial HSC Examination- Mathematics	
Part	Solution	Marks
(a) i)	$\frac{d}{dx}\left(2x^3+x^{-3}\right)=6x^2-3x^{-4}$	2
ii)	$\frac{d}{dx}\left(\frac{1}{e^{2x}}-\sin x\right)=\frac{d}{dx}\left(e^{-2x}-\sin x\right)$ $=-2e^{-2x}-\cos x$	2
(b) i)	$\int \sec^2 x-e^{4x}\ \ dx=\tan x-\frac{e^{4x}}{4}+c$	2
ii)	$\int_1^e x^2+\frac{2}{x}dx=\left[\frac{x^3}{3}+2\ln x\right]_1^e$ $=\frac{e^3}{3}+2\ln e-\frac{1}{3}-2\ln 1$ $=\frac{e^3}{3}+2-\frac{1}{3}-0$ $=\frac{e^3-1}{3}+2$	3
(c)	$y=\cos x$  $Area\quad=\int_0^{\frac{\pi}{3}}\cos s dx$ $=\left[\sin x\right]_0^{\frac{\pi}{3}}$ $=\sin\frac{\pi}{3}-\sin 0$ $=\frac{\sqrt{3}}{2}units^2$	3

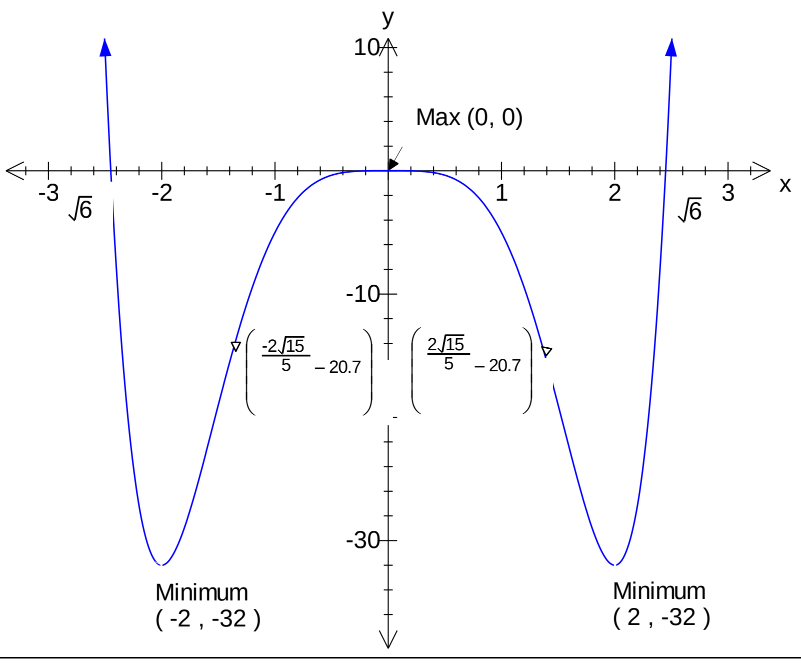
Question 3	Trial HSC Examination- Mathematics	
Part	Solution	Marks
(a) i)	Midpoint of (1, 6) and (5, 0). $MP=\left(\frac{1+5}{2},\frac{6+0}{2}\right)=\left(\frac{6}{2},\frac{6}{2}\right)=(3,3)$	1
ii)	Show that (3,3) lies on $2x-3y+3=0$ $LHS=2(3)-3(3)+3$ $=6-9+3$ $=0=RHS$ So M lies on BD.	1
iii)	$\text{Gradient AC}=m_1=\frac{6-0}{1-5}=\frac{6}{-4}=-\frac{3}{2}$	1
iv)	Find gradient m_2 of BD $2x-3y+3=0$ $2x-3y+3=0$ $3y=2x+3$ $y=\frac{2}{3}x+1$ $\therefore m_2=\frac{2}{3}$ $m_1.m_2=-\frac{3}{2}.\frac{2}{3}=-1$ $\therefore$ BD is perpendicular to AC	2
v)	$AC=\sqrt{(5-1)^2+(0-6)^2}=\sqrt{16+36}=\sqrt{52}=2\sqrt{13}$	1
(vi	The lines AC and BD would form the diagonals of the quadrilateral ABCD. BD is the perpendicular bisector of AC from ii and iv above.. The diagonals of a kite meet at right angles and one diagonal bisects the other, so ABCD meets the criteria for a kite.	1
(b) i)	$S_n=\frac{n}{2}(a+l)$ Integers: 1 + 2 + 3 + ….. + 200 $S_{200}=\frac{200}{2}(1+200)=20\,100$	2
ii)	Mult of 2 : 2 + 4 + 6 + …...+ 200 $S_{100}=\frac{100}{2}(2+200)=10\,100$ Mult of 3: 3 + 6 + 9 + …...+ 198 $S_{66}=\frac{66}{2}(3+198)=6\,633$ Mult of 6: 6 + 12 + 18 + …+ 198 $S_{33}=\frac{33}{2}(6+198)=3\,366$ $\therefore$Total Sum = Integers – (Mult 2 + Mult 3 - Mult 6) = 20 100 – 10 100 – 6 633 + 3 366 = 6 733	3

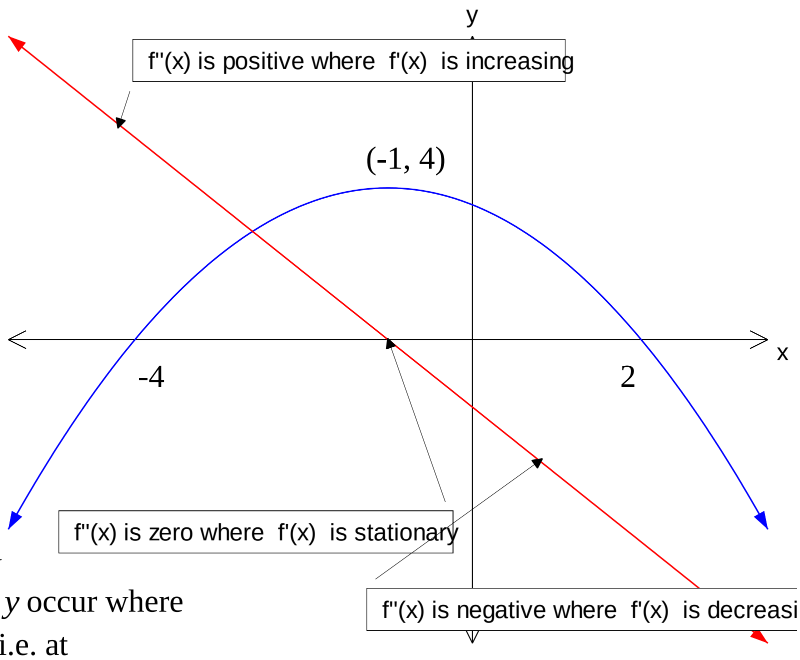
Question 4	Trial HSC Examination- Mathematics	
Part	**Solution**	**Marks**
(a)	$\sqrt{\dfrac{\operatorname{cosec}^2 x-\cot^2 x-\cos^2 x}{\cos^2 x}}=\sqrt{\dfrac{1-\cos^2 x}{\cos^2 x}}$ $=\sqrt{\dfrac{\sin^2 x}{\cos^2 x}}$ $=\dfrac{\sin x}{\cos x}$ $=\tan x$	2
(b)	$2.12\times180\div\pi=121.467...=121^{\circ}28'$	1
(c)	Domain $-3\le x\le3$ Range $0\le y\le3$	2
(d) i)		1
ii)	$\tan16^\circ=\dfrac{142}{AK}$ $\tan20^\circ=\dfrac{142}{KB}$ $AK=\dfrac{142}{\tan16^\circ}$ $KB=\dfrac{142}{\tan20^\circ}$ $=495.2$ $=390.1$ Distance AB = 495.2 + 390.1 = 885 m (nearest m)	2
(e) i)	 $PQ^2=360^2+480^2-2\times360\times480\cos110^\circ$ $PQ^2=478202$ $PQ=692$ km (nearest km)	2

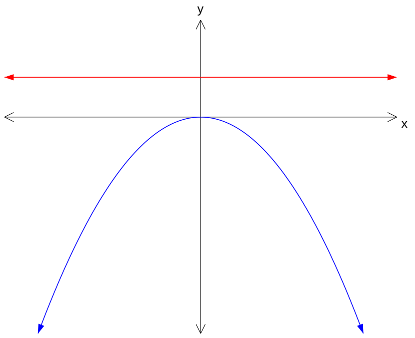
Question 4	Trial HSC Examination- Mathematics	
Part	Solution	Marks
(e) ii)	First find $\angle QPR$ $\frac{\sin\angle QPR}{480} = \frac{\sin 110°}{692}$ $\sin\angle QPR = \frac{480\times\sin 110°}{692}$ $\sin\angle QPR = 0.652$ $\angle QPR = 41°$ $\angle NPR = 150°$ $Bearing(\angle NPQ) = 150° - 41°$ $= 109°$ Can also be found using cos rule using the 3 sides..	2

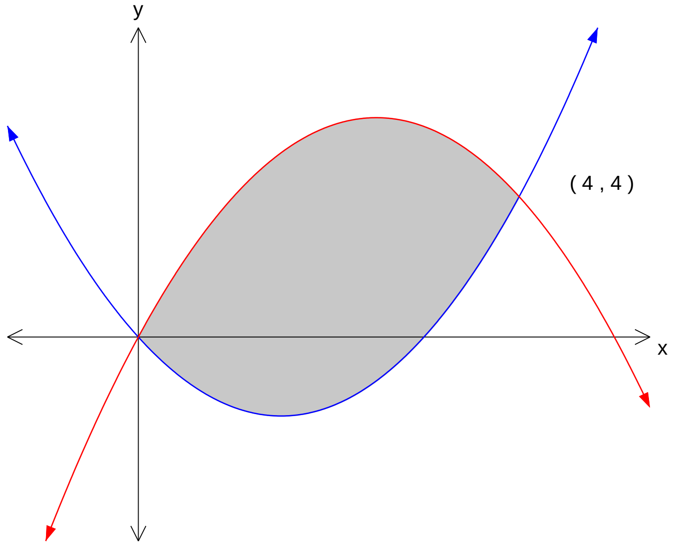
Question 5	Trial HSC Examination- Mathematics	
Part	**Solution**	**Marks**
(a) i)	$\angle EAD = 60^\circ$ (equilateral Δ) $\angle DAC = 45^\circ$ (isosceles right Δ) $\therefore \angle EAB = \angle EAD + \angle DAC + \angle CAB$ $= 60^\circ + 45^\circ + 51^\circ$ $= 156^\circ$	3
ii)	$\angle ABC = 180^\circ - 156^\circ$ (cointerior $\angle$ on || lines AE and BC) $= 24^\circ$	1
(b)	$x = \dfrac{+5 \pm \sqrt{5^2 - 4\times 2\times(-4)}}{2(2)}$ $= \dfrac{5 \pm \sqrt{57}}{4}$	2
(c)	$\cos A = \dfrac{4^2 + 5^2 - 7^2}{2\times 4\times 5} = -\dfrac{1}{5}$ $A = 101.53....$ $= 102^0$	2
(d)	$\dfrac{5(m-3) - 2(m-2)}{(m-2)(m-3)}$ $= \dfrac{5m - 15 - 2m + 4}{(m-2)(m-3)}$ $= \dfrac{3m - 11}{(m-2)(m-3)}$	2
(c)	$3x - y = 10$ (1) $x = y + 2$ (2) $3(y+2) - y = 10$ (3) sub (2) in (1) $3y + 6 - y = 10$ $2y = 4$ $y = 2$ $x = (2) + 2$ sub y in (2) $x = 4$ solution (4, 2)	2

Question 6	Trial HSC Examination- Mathematics	
Part	Solution	Marks
(a) (i)	$y = x^6 - 6x^4$ Crosses axis where $x^6 - 6x^4 = 0$ $x^4\left(x^2 - 6\right) = 0$ $x^4\left(x - \sqrt{6}\right)\left(x + \sqrt{6}\right) = 0$ Crosses axis where $x = 0$ and $x = \pm\sqrt{6}$	2
(a) (ii)	$y = x^6 - 6x^4$ $y' = 6x^5 - 24x^3$ $= 6x^3\left(x^2 - 4\right)$ $= 6x^3\left(x - 2\right)\left(x + 2\right)$ $y'' = 30x^4 - 72x^2$ Stationary points where $x = 0, y = 0, y'' = 0$ $x = 2, y = -32, y'' = 192$ $x = -2, y = -32, y'' = 192$ Stationary points $\left(-2, -32\right), \left(0, 0\right)\left(2, -32\right)$ $y'' = 30x^4 - 72x^2$ At $x = 0$ $y'' = 0$ so test either side At $x = 1$ $y'' = -42$ $\therefore$ concave down. At $x = -1$ $y'' = -42$ $\therefore$ concave down $\therefore$ maximum at (0, 0) At $x = 2$ $y'' = 192$ $\therefore$ minimum at (2, -32). At $x = -2$ $y'' = 192$ $\therefore$ minimum at (-2 , -32).	4

Question 6	Trial HSC Examination- Mathematics	
Part	**Solution**	**Marks**
(a) (iii)	$y'' = 30x^4 - 72x^2$ $= 6x^2\left(5x^2 - 12\right)$ $= 6x^2\left(\sqrt{5}x - 2\sqrt{3}\right)\left(\sqrt{5}x + 2\sqrt{3}\right)$ $x = 0 \quad y = 0$ $x = \frac{2\sqrt{3}}{\sqrt{5}} = \frac{2\sqrt{15}}{5} \quad y = -20.736$ $x = -\frac{2\sqrt{3}}{\sqrt{5}} = -\frac{2\sqrt{15}}{5} \quad y = -20.736$ Check for changes of concavity From above, no change at (0, 0) but there is a change at $\left(\pm\frac{2\sqrt{15}}{5}, -20.736\right)$ Inflexions at $\left(\pm\frac{2\sqrt{15}}{5}, -20.736\right)$	2
iv)		2

Question 6	Trial HSC Examination- Mathematics	
Part	**Solution**	**Marks**
(b)	 Stationary points on y occur where $f'(x) = 0$ i.e. at $x = -4$ here $f''(x)$ is positive $\therefore$ min turning point at $x = -4$ and $x = 2$ here $f''(x)$ is negative $\therefore$ max turning point at $x = 2$	2

Question 7	Trial HSC Examination- Mathematics	
Part	Solution	Marks
(a) i)	$x^2 = -8y$ $x^2 = -4(2)y$ $a = 2$  Focus is (0, -2)	1
ii)	Directrix is $y = 2$	1
iii)	$x^2 = -8y$ $x^2 = (-8)^2 = 64$ $-8y = -8(-8) = 64$ $\therefore (-8, -8)$ lies on the parabola.	1
iv)	Chord through (0, -2) and (-8, -8) $m = \frac{-8+2}{-8-0} = \frac{-6}{-8} = \frac{3}{4}$ $y - y_1 = m(x - x_1)$ $y - (-2) = \frac{3}{4}(x - 0)$ $y = \frac{3}{4}x - 2$ $3x - 4y - 8 = 0$	2
v)	$x^2 = -8y$ $y = -\frac{x^2}{8}$ $y' = -\frac{x}{4}$ At A $y' = -\frac{-8}{4} = 2$ $y - (-8) = 2(x - -8)$ $y + 8 = 2x + 16$ $y = 2x + 8$	2

(b) i)	Substitute $y = x^2 - 3x$ into $y = 5x - x^2$ $5x - x^2 = x^2 - 3x$ $2x^2 - 8x = 0$ $2x(x - 4) = 0$ $x = 0, \quad y = 0$ $x = 4, \quad y = 4$ Intersect at (0, 0) and (4, 4).	2
ii)	 $Area = \int_0^4 5x - x^2 dx - \int_0^4 x^2 - 3x dx$ $= \int_0^4 8x - 2x^2 \; dx$ $= \left[4x^2 - \frac{2x^3}{3} \right]_0^4$ $= \left(64 - \frac{128}{3} \right) - 0$ $= \frac{64}{3} = 21\frac{1}{3} u^2$	3

Question 8	Trial HSC Examination- Mathematics	
Part	Solution	Marks
(a)	$x^2 y = 1$ ie $x^2 = \frac{1}{y}$ $V = \pi\int_1^4 x^2 dy = \pi\int_1^4 \frac{1}{y}\, dy$ $= \pi[\ln y]_1^4 = \pi[\ln 4 - \ln 1]$ $= \pi \ln 4 \quad units^3$	4
(b)	$\log_8 4 = \frac{\log_2 4}{\log_2 8} = \frac{2}{3}$	1
(c) i)	$\angle$EAC=67^0 (Data) $\angle$BCA=$\angle$EAC (Alt $\angle$'s, AE $\parallel$ BF) $\therefore \angle$BCA=67^0 $\angle$ABC=$\angle$BDC + $\angle$BCD (Ext $\angle$ = sum of 2 interior opp$\angle$s) =32^0+35^0=67^0 $\therefore \Delta$ABC is isosceles (Base $\angle$ of an isosceles Δ)	3
ii)	$\angle$BAC + 67^0 + 67^0 = 180^0 $\angle$BAC = 46^0	1
(d)	$\int_1^3 g(x)\,dx \approx \frac{1}{6}\{12 + 4(8) + 2(0) + 4(3) + 5\}$ $\approx \frac{61}{6}$ $\approx 10\frac{1}{6}$	2
(e)	$\sum_{n=2}^{5} n^2 - 1 = (2^2 - 1) + (3^2 - 1) + (4^2 - 1) + (5^2 - 1)$ $= 3 + 8 + 15 + 24$ $= 50$	1

Question 9	Trial HSC Examination- Mathematics	
Part	**Solution**	**Marks**
(a)	$y=2x^2-2$ $V=\pi\int_0^6 x^2dy$ $=\pi\int_0^6 \frac{y+2}{2}dy$ $=\pi\left[\frac{y^2}{4}+y\right]_0^6$ $=\pi\left[\left(\frac{36}{4}+6\right)-(0)\right]$ $=15\pi \text{ u}^3$	3
(b)	θ = 1 and $A=\frac{1}{2}r^2\theta$ $A=0\cdot5\times5^2\times1=12.5cm^2$	1
(c)	$f'(x)=2e^x$ $f'(0)=2$ slope of tangent $y-2=2x$ $y=2x+2$	2
(d) i)	4 × 250 × 30 = $30 000	1
ii)	$250 \times 1{\cdot}02^{120}$ = $2 691·29	1
iii)	$250 \times (1{\cdot}02^{120} + 1{\cdot}02^{119} + 1{\cdot}02^{118} + \ldots\ldots + 1{\cdot}02)$ $250 \times \frac{a(r^n-1)}{r-1}=250\times\frac{1\cdot02(1\cdot02^{120}-1)}{1\cdot02-1}$ 250 × 498·02328 = $124 505·83	3
iv)	$124 505·83 - $30 000 = $94 505.83	1

Question 10	Trial HSC Examination- Mathematics	
Part	Solution	Marks
a) i)	in this case the other side equals 200 – 2x Then A = x(200 – 2x) = 200x -2x^2	2
ii)	$\frac{dA}{dx} = 200 - 4x$ which = 0 when x = 50 then A = 100 × 50 = 5 000m^2 this is a maximum since if we take w = 49 then l = 102 and A = 4998	3
b) i)	$2y = x^2 - 4x \qquad 2y + 4 = x^2 - 4x + 4$ $4 \times \frac{1}{2}(y+2) = (x-2)^2$	2
ii)	Focus is (2, -1·5)	1
iii)	Directrix $y = -2 \cdot 5$	1
c) i)	$I = \frac{1}{4}\sin(4x) + c$	1
ii)	$\int_1^{e^4} \frac{x}{x^2+4}.dx = \frac{1}{2}\int_1^{e^4} \frac{2x}{x^2+4}.dx$ $\frac{1}{2}\left[\ln(x^2+4)\right]_1^{e^4} = \frac{1}{2}(\ln(e^8+4) - \ln 5)$ $= \ln\sqrt{\frac{e^8+4}{5}}$	2

End of Examination