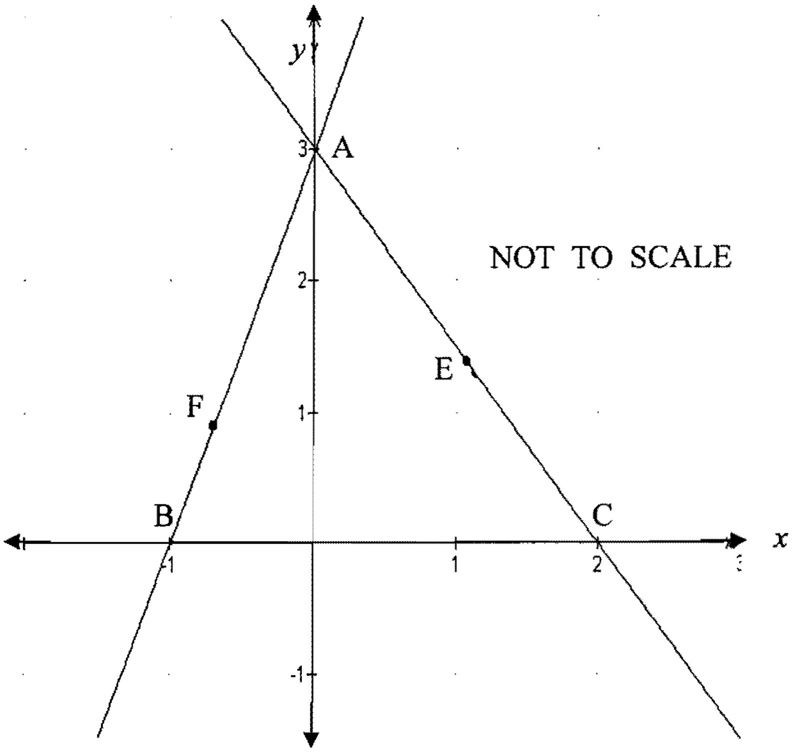
Jamie

WR 2003

QUESTION 3 (12 MARKS) Use a SEPARATE Sheet of Paper

The points A (0,3), B (-1,0) and C (2,0) are the vertices of a triangle.



(a) Find the gradient of the line AC.

(b) Show that the equation of AC is $3x+2y-6=0$

(c) BE is the altitude from B to AC.
Show that BE has equation $2x-3y+2=0$.
(BE is perpendicular to AC)

(d) Calculate the length of the line segment BE.

(e) Given that the altitude CF has equation $x+3y-2=0$, show that CF and BE intersect on the y axis.

(f) Find the midpoint of AC.

(g) Show that the altitude from B does not pass through the midpoint of AC.

DO NOT TOUCH ... THE POLICE WILL BE CALLED

WR 2005

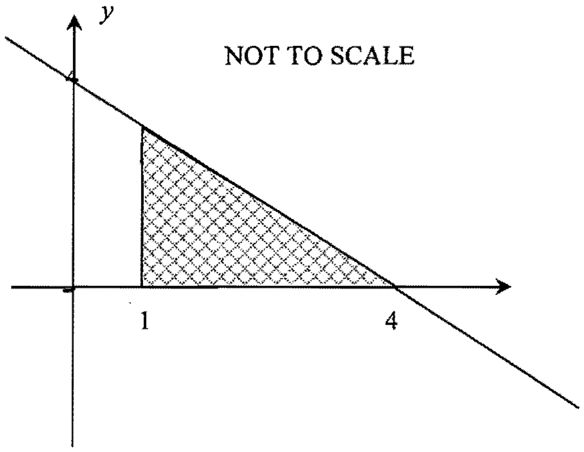
Question 3 **(12 Marks)** Use a Separate Sheet of paper **Marks**

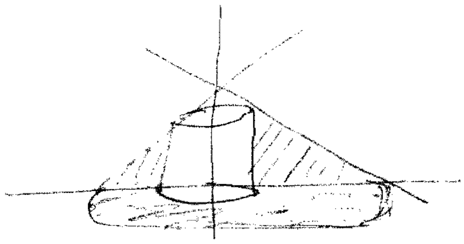
(a) Differentiate the following with respect to x.

(i) $\sqrt[4]{x^3}$ **2**

(ii) $\sin x . \ln x$ **2**

(iii) $\dfrac{\sin x}{e^x}$ **2**





(b) $y = 4 - x$ is shown on the graph. **3**

Calculate the volume of the solid formed when the area bounded by the function, x axis and $x = 1$ is rotated around the y axis.

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

$g(x)$ takes the value 4 when $x = 1$. Find $g(x)$.

$y = 4 - x$

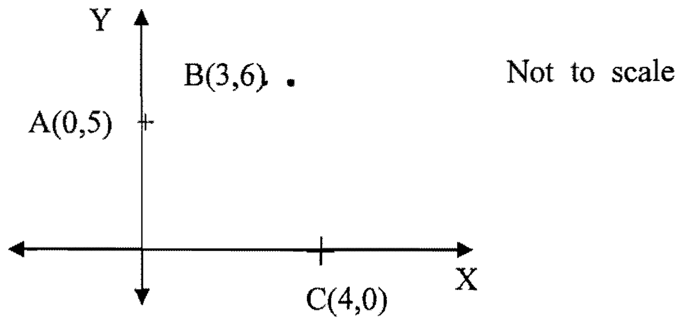
$x = 1$

$\int (4 - x)^2 - \int 1$

Trialmath 2008

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

(a) The vertices of the triangle ABC are the points A(0,5), B(3,6) and C(4,0)



(i) Find the gradient of the side AB **1**

(ii) Find the equation of the line AB, giving your answer in the general equation form ax+by+c = 0. **2**

(iii) A line through C, parallel to AB, cuts the y axis at M.
Find the coordinates of M. **2**

(iv) Find the distance AM **1**

(v) Find the area of triangle AMC **1**

(b) Solve for x: $2^{2x}-2(2^{x})-8=0$ **3**

(c) If $\int_0^a (3-4x)=1$ find the value(s) of a? **2**

Question 3 continued **Marks**

b) Michael is training for a local marathon. He has trained by completing practice runs over the marathon course. So far he has completed three practice runs with times shown below.

Week 1	Week 2	Week 3
3 hours	2 hours 51 minutes	2 hours 42 minutes 27 seconds

i) Show that these times form a geometric series with a common ratio $r = 0.95$. **1**

ii) If this series continues, what would be his expected time in Week 5, to the nearest second? **1**

iii) How many hours, minutes and seconds (to the nearest second) will he have run in total in his practice runs in these 5 weeks? **1**

iv) If the previous winning time for the marathon was 2 hours and 6 minutes, how many weeks must he keep practicing to be able to run the marathon in less that the previous winning time? **2**

TRIALMATH 2009

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

(a) Differentiate with respect to x:

(i) $y = x^2 \ln x$ **2**

(ii) $y = \sin^2 2x$ **2**

(b) Find:

(i) $\int \cos 2x \, dx$ **2**

(ii) $\int_0^1 \frac{3}{x+1} dx$ **2**

(c) If $\frac{dy}{dx} = 6x - 1$ and the function passes through $(1, 2.5)$, find y as a function of x. **2**

(d) Use the trapezoidal rule with four function values, to find an approximate value of the area under the curve $y = 3^x$, bounded by the x axis and x = 1 and x = 4 **2**

WR 2009

Question 3 **(12 Marks)** Use a Separate Sheet of paper **Marks**

(a) Differentiate with respect to x.

i. $3x\sqrt[3]{x}$ **2**

ii. $\frac{\sin 2x}{e^{2x}}$ **2**

(b) Find:

i. $\int \frac{dx}{e^{3x}}$ **2**

ii. $\int_0^{\pi} \sec^2 \frac{x}{4}\, dx$. **2**

(c) If α and β are the roots of the equation $3x^2 - 4x - 7 = 0$
Find:

i. $\alpha + \beta$. **1**

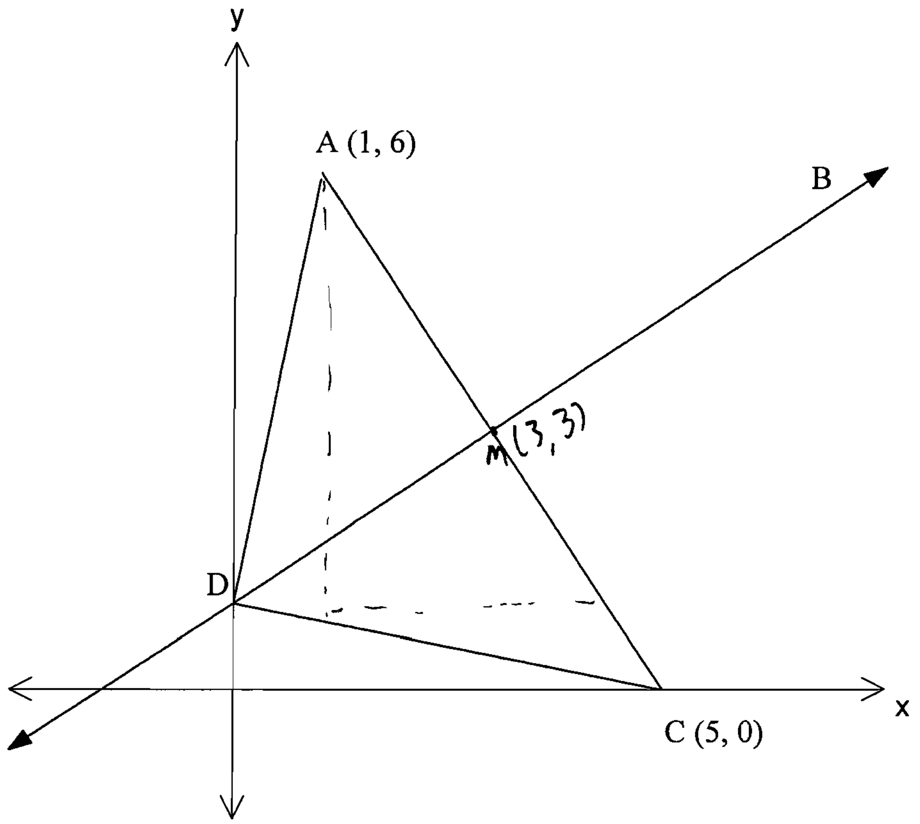
ii. $2\alpha^2 + 2\beta^2$. **1**

iii. the equation with roots $2\alpha^2$ and $2\beta^2$. **2**

WR 2008

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**

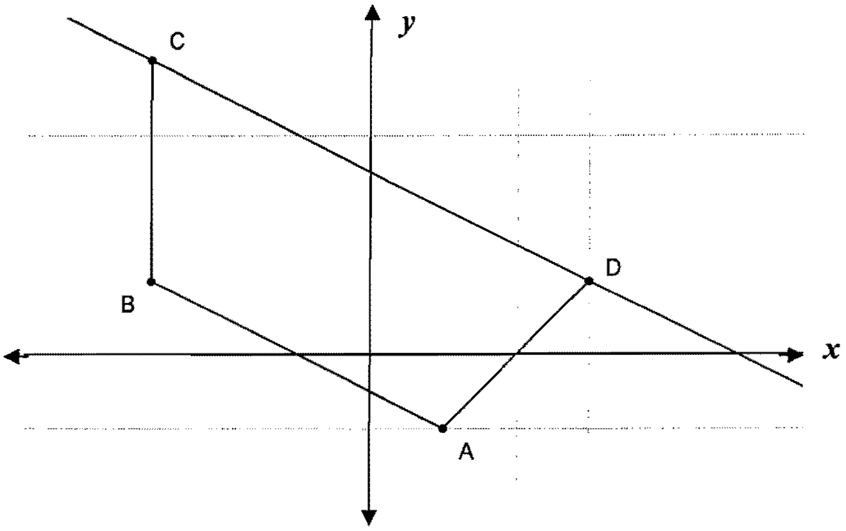
vi) Explain why the quadrilateral ABCD is a kite regardless of the position of B. **1**

Question 3 continues on page 5

WR 2007

Question 3 (12 marks) Begin a SEPARATE sheet of paper

(a) A (1, -1) B (-3, 1) C (-3, 4) and D (3, 1) are points on the Cartesian Plane. AB||CD



(i) Find the distances AB and DC **2**

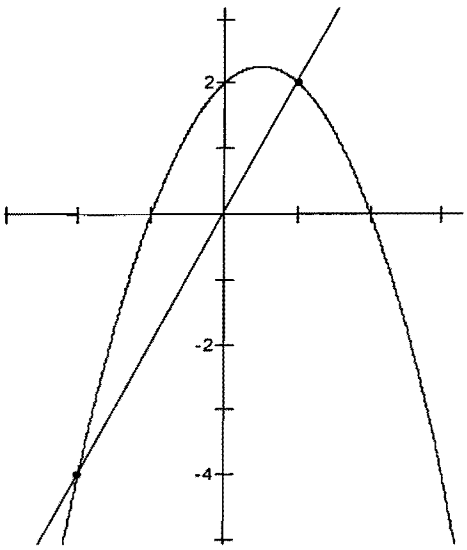
(ii) Show that the equation of CD is $x+2y-5=0$ **2**

(iii) Find the perpendicular distance of A from CD **2**

(iv) Hence or otherwise obtain the area of the trapezium ABCD **1**

(b) Find the equation of the tangent to the curve $y=\sin 3x$ at the point where $x=\frac{\pi}{3}$ **3**

(c) The graphs of $y=2x$ and $y=-x^2+x-2$ are shown. Solve $0 > x^2+x+2$ **2**



Trialmath 2005
Question 3 (12 marks) **Marks**

(a) Differentiate

(i) $\left(e^{2x+1}\right)\sin x$ **2**

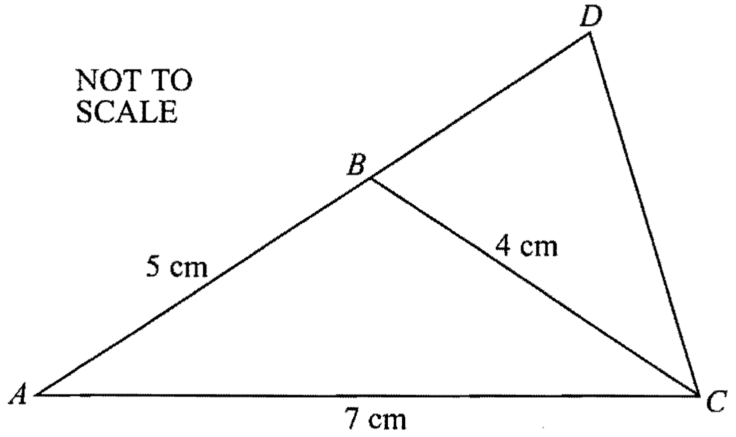
(ii) $\dfrac{\tan 3x}{3x+2}$ **2**

(b) Find

(i) $\displaystyle\int \frac{3}{\sqrt{e^x}}\,dx$ **2**

(ii) $\displaystyle\int \frac{\cos 2x}{\sin 2x}\,dx$ **2**

(c)



In the above diagram, ABC is a triangle in which $AB = 5$ cm, $BC = 4$ cm, $AC = 7$ cm and AB is produced to D such that $AD = AC$.

(i) Find the size of the smallest angle in ΔABC. Express your answer to the nearest degree. **2**

(ii) Hence, find CD. Express your answer to 2 decimal places. **2**