Student Number

BAULKHAM HILLS HIGH SCHOOL

HIGHER SCHOOL CERTIFICATE

TRIAL EXAMINATION

2008

MATHEMATICS
EXTENSION 1

Time allowed: Two Hours
(Plus 5 mins reading time)

GENERAL INSTRUCTIONS

- Attempt all questions
- There are seven questions - start each question on a new page
- All necessary working should be shown
- Write, using black or blue pen
- Write your student number at the top of each page of the answer sheets
- At the end of the exam, staple your answers in order, behind the cover sheet.

Marks

Question 1

a) A and C have co-ordinates $(-1,2)$ and $(6,10)$ respectively. Find the point B which divides AC internally in the ratio $2:3$. **2**

b) Find $\int \frac{4x}{2x+1}\,dx$ using the substitution $u = 2x+1$. **3**

c) State the domain of the function $y = log_e\left(\frac{3x-1}{x+2}\right)$. **3**

d) i) Show that the curves $y = e^{x-1}$ and $y = e^{-x}$ intersect at $x = \frac{1}{2}$. **1**

ii) Find the acute angle between the curves at this point. **3**

Question 2 (start a new page)

a) Find the constant term in the expansion $\left(3x^2 + \frac{5}{x^3}\right)^{10}$. **3**

b) Solve $sin\ 4x = cos2x$ for $0^\circ \le x \le 360^\circ$ **3**

c) Evaluate $\int_0^{\frac{3}{4}} \frac{dx}{\sqrt{9-4x^2}}$. **3**

d) Taking $x = 2$ as the first approximation for the root of $\sin x - \frac{x}{3} = 0$ find a closer approximation of the root using one application of Newton's method. **3**

Question 3 (start a new page)

a) Find the volume when the area between $y = 2\sin x$, the x and y axes and $x = \frac{\pi}{4}$ is rotated about the x axis. **4**

b) i) State the domain and range of $y = 2\cos^{-1}(x-1)$ **2**

ii) Hence sketch the curve **2**

c) If α, β and γ are the roots of the cubic $2x^3 - 5x^2 - 3x + 1 = 0$, find

i) $\alpha + \beta + \gamma$ **1**

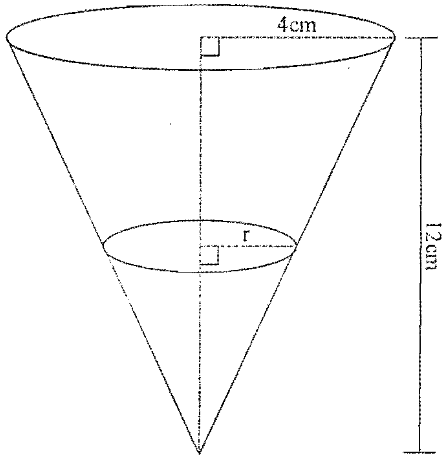
ii) $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma}$ **1**

iii) $\alpha^2 + \beta^2 + \gamma^2$ **2**

Marks

Question 4 (start a new page)

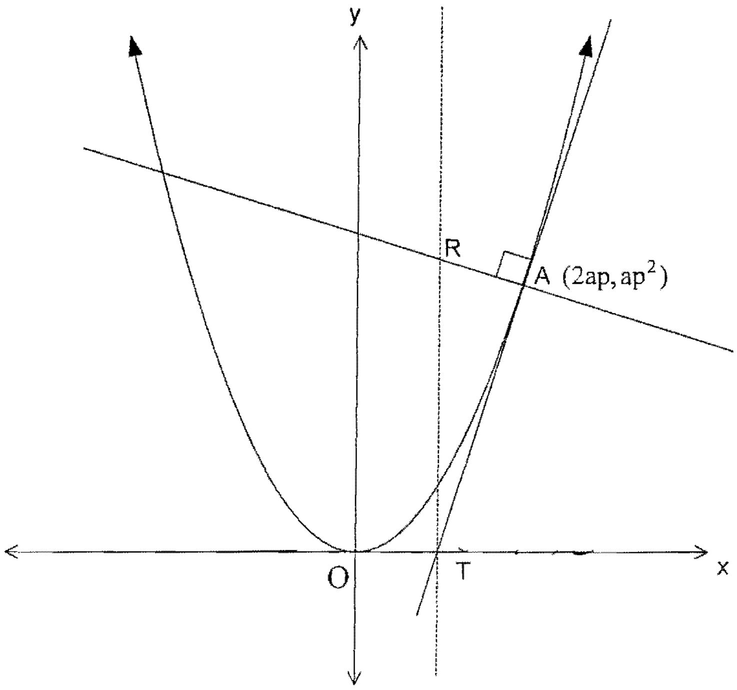
a) The diagram shows a conical drinking cup of height 12cm and radius 4cm. The cup is filled with water at a rate of 3cm^3 per second. The height of water at time t seconds is h cm and the radius of the water's surface is r cm.



i) Show that $r = \frac{1}{3}h$. **1**

ii) Find the rate at which the height is increasing when the height of the water is 9cm. ($V = \frac{1}{3}\pi r^2 h$ is the volume of a cone.) **3**

b) $x = 2at$ and $y = at^2$ are parametric equations for the parabola below.



Marks

Question 4 (cont.)

i) By finding the Cartesian equation of the parabola, find the equation of the tangent at the point A. **2**

ii) The tangent cuts the x axis at T. Find the coordinates of T. **1**

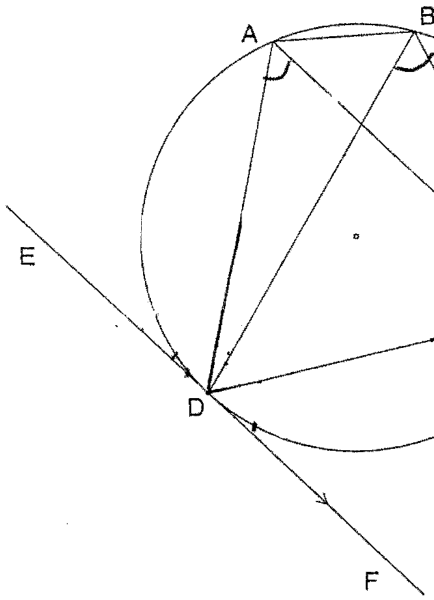
iii) Find the equation of the normal at A. **1**

iv) A line through T parallel to the axis of the parabola cuts the normal at R. Show that the coordinates of R are $(ap, ap^2 + a)$. **1**

v) Show that the locus of R is a parabola and state the equation of it's directrix. **3**

Question 5 (start a new page)

a) ABCD is a cyclic quadrilateral. EF is a tangent to the circle and AC || EF. **3**



Prove BD bisects $\angle ABC$.

b) The velocity of a particle as it moves along the X axis is given by

$v^2 = -9x^2 + 18x + 27$

i) Show that the particle undergoes Simple Harmonic Motion. **2**

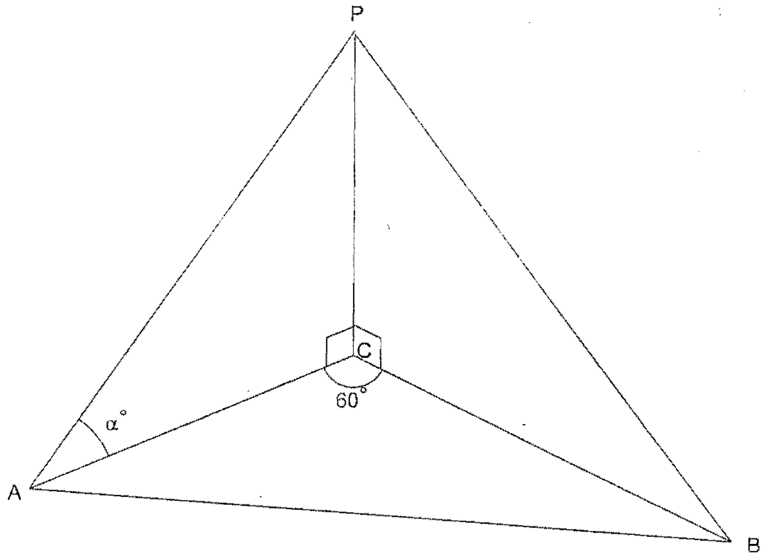
ii) What is the period of the motion? **1**

iii) What is the amplitude of the motion? **2**

Marks

Question 5 (cont.)

c) The position of two yachts, A and B out at sea subtend an angle of 60° at the base C of a cliff. The distance AC is 3 times the height of the cliff and the distance BC is 4 times the height of the cliff.



i) Show that the angle of elevation α° of the cliff from Point A is $18^\circ 26'$ **1**

ii) The distance AB is 300 metres greater than the height of the cliff. Find the height of the cliff. **3**

Question 6 (start a new page)

a) Solve $\left|x^2 - 9\right| < 8$ **3**

b) By integrating both sides of the expansion

$(1 + x)^n = {}^nC_0 + {}^nC_1x + \ldots\ldots\ldots + {}^nC_nx^n$ prove **3**

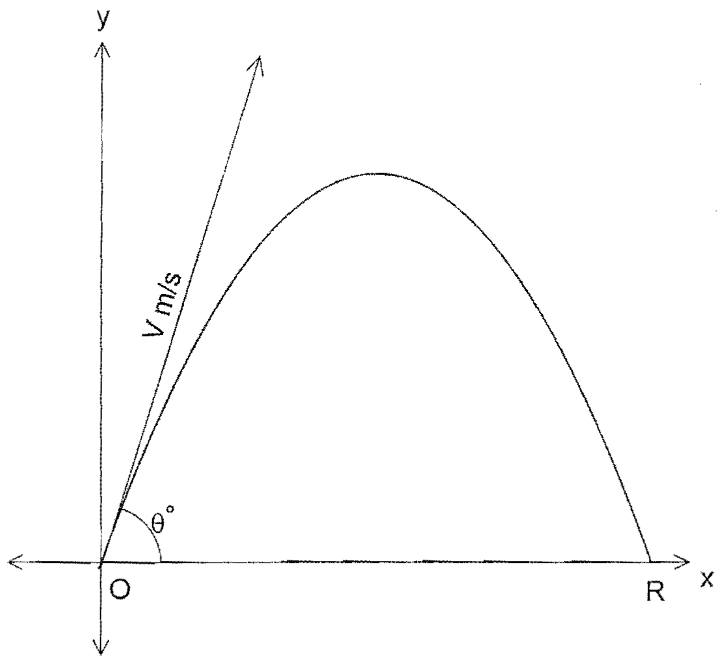
$$1 - \frac{1}{2}{}^nC_1 + \frac{1}{3}\,{}^nC_2 + \ldots\ldots + \frac{(-1)^n}{n+1}\,{}^nC_n = \frac{1}{n+1}$$

Marks

Question 6 (cont.)

c) A projectile is fired with velocity $V\,m/s$ from a point 0 at an angle θ with the horizontal and hits the ground at a horizontal distance R from 0.
Taking $g = 10\text{m/s}^2$ you may assume the equations of motion for the projectile.

$$\text{i.e.}\quad \begin{array}{ll} \ddot{x} = 0 & \ddot{y} = -10 \\ \dot{x} = V\cos\theta & \dot{y} = -10t + V\sin\theta \\ x = Vt\cos\theta & y = -5t^2 + Vt\sin\theta \end{array}$$



i) Show that the range $R = \dfrac{V^2 \sin 2\theta}{10}$ and that the maximum range is given by $\dfrac{V^2}{10}$. **3**

ii) The maximum range of a certain rifle is 2000 metres. **3**
How much is the range increased when the rifle is mounted on a car travelling at 30 m/s towards the target, the angle of elevation being unaltered.

Marks

Question 7 (start a new page)

a) i) Show that $\dfrac{d}{dx}\left(\tan^3 x\right) = 3\tan^2 x + 3\tan^4 x$ **2**

ii) Hence find $\int \tan^4 x \ dx$ **3**

b) Prove by Mathematical Induction that

$3 \times 2^2 + 3^2 \times 2^3 + \ldots\ldots\ldots\ldots + 3^n \times 2^{n+1} = \dfrac{12}{5}\left(6^n - 1\right)$ for all positive integers n. 4

c) If the 3rd and 4th terms of the binomial $(1 + ax)^n$ are $264x^2$ and $1760x^3$ and $n > a$, find the values of a and n. **3**

End of Exam

Yr 12 2008 EXT 1 Trial Solutions

1 a) $(-1,2)$ $(6,10)$

$2:3$

$$\left(\frac{2(6)+3(-1)}{2+3}, \frac{2(10)+3(2)}{2+3}\right) \quad (1)\ (1)$$

$$= \left(\frac{9}{5}, \frac{26}{5}\right)$$

b) $\int \frac{4x}{2x+1}\,dx$ using $u = 2x+1$

$\frac{du}{dx} = 2$ $\qquad x = \frac{u-1}{2}$

$dx = \frac{du}{2}$ (1)

$$\int \frac{4\left(\frac{u-1}{2}\right)\cdot\frac{du}{2}}{u}$$

$$= \int \frac{u-1}{u}\,du \quad (1)$$

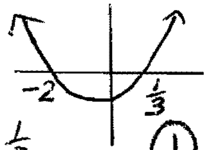
$$= \int 1 - \frac{1}{u}$$

$$= u - \ln u + c \quad (1)$$

$$= (2x+1) - \ln(2x+1) + c$$

(ignore c)

c) $\frac{3x-1}{x+2} > 0$ (1) $\therefore (3x-1)(x+2) > 0$ (1)



$x < -2$, $x > \frac{1}{3}$ (1)

d) (i) $y = e^{-x}$ $\quad y = e^{x-1}$

$\therefore e^{-x} = e^{x-1}$

$\therefore -x = x-1$

$2x = 1$

$x = \frac{1}{2}$ $\Big\}$ (1)

(ii) $y = e^{-x}$ $\qquad y = e^{x-1}$

$y' = -e^{-x}$ $\qquad y' = e^{x-1}$

at $x = \frac{1}{2}$ $y' = -e^{-\frac{1}{2}}$ $\qquad$ at $x = \frac{1}{2}$

$y' = -\frac{1}{\sqrt{e}}$ $\qquad y' = \frac{1}{\sqrt{e}}$ (1)

$$\tan\theta = \frac{\frac{1}{\sqrt{e}} + \frac{1}{\sqrt{e}}}{1 + \frac{1}{\sqrt{e}}\cdot\frac{-1}{\sqrt{e}}} \quad (1)$$

$$= \frac{\frac{2}{\sqrt{e}}}{1 - \frac{1}{e}}$$

$$\theta = 62^\circ 29' \quad (1)$$

Question 2.

a) $\left(3x^2 + \frac{5}{x^3}\right)^{10}$

$T_{k+1} = {}^{10}C_k (3x^2)^{10-k}(5x^{-3})^k$ (1)

$= {}^{10}C_k\, 3^{10-k} x^{20-2k}\, 5^k x^{-3k}$

$= {}^{10}C_k\, 3^{10-k}\, 5^k \cdot x^{20-5k}$

Constant term $20 - 5k = 0$, $k = 4$ $\Big\}$ (1)

Constant term is

$\therefore T_5 = {}^{10}C_4\, 3^6 5^4$ (1)

b) $\sin 4x = \cos 2x$ $\qquad 0 \le x \le 360^\circ$

$2\sin 2x\cos 2x = \cos 2x$

$2\sin 2x\cos 2x - \cos 2x = 0$

$\cos 2x(2\sin 2x - 1) = 0$ (1)

$\cos 2x = 0$ $\qquad \sin 2x = \frac{1}{2}$

$2x = 90^\circ, 270^\circ, 450^\circ, 630^\circ,\ 30^\circ, 150^\circ, 390^\circ, 510^\circ$

$x = \underbrace{45, 135, 225^\circ, 315^\circ}_{(1)},\ \underbrace{15^\circ, 75^\circ, 195^\circ, 255^\circ}_{(1)}$

2c) $\int_0^{\frac{3}{4}} \frac{dx}{\sqrt{9-4x^2}}$

$= \int_0^{\frac{3}{4}} \frac{dx}{\sqrt{4(\frac{9}{4}-x^2)}}$

$= \frac{1}{2} \int_0^{\frac{3}{4}} \frac{dx}{\sqrt{(\frac{3}{2})^2-x^2}}$ (1)

$= \frac{1}{2} \left[\sin^{-1}\left(\frac{2x}{3}\right)\right]_0^{\frac{3}{4}}$ (1)

$= \frac{1}{2}\left[\sin^{-1}\left(\frac{2}{3}\cdot\frac{3}{4}\right) - \sin^{-1}(0)\right]$

$= \frac{1}{2}\left[\frac{\pi}{6} - 0\right]$

$= \frac{\pi}{12}$ (1)

d) $a_1 = 2 - \frac{f(2)}{f'(2)}$ (1)

$f(x) = \sin x - \frac{x}{3}$ $\quad f(2) = 0.24$

$f'(x) = \cos x - \frac{1}{3}$ $\quad f'(2) = -0.75$ (1)

$\therefore a_1 = 2 - \frac{0.24}{-0.75}$

$a_1 = 2.3$ (1)

Question 3.

a) $V = \pi \int_0^{\frac{\pi}{4}} 4\sin^2 x \, dx$ (1)

$= \pi \int_0^{\frac{\pi}{4}} 4\left(\frac{1}{2} - \frac{\cos 2x}{2}\right) dx$ (1)

$= 2\pi \int_0^{\frac{\pi}{4}} (1 - \cos 2x)\, dx$

$= 2\pi \left[x - \frac{\sin 2x}{2}\right]_0^{\frac{\pi}{4}}$ (1)

$= 2\pi\left[\frac{\pi}{4} - \frac{\sin\frac{\pi}{2}}{2}\right] - [0-0]$

$= 2\pi\left[\frac{\pi}{4} - \frac{1}{2}\right]$

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

b) (i) $y = 2\cos^{-1}(x-1)$

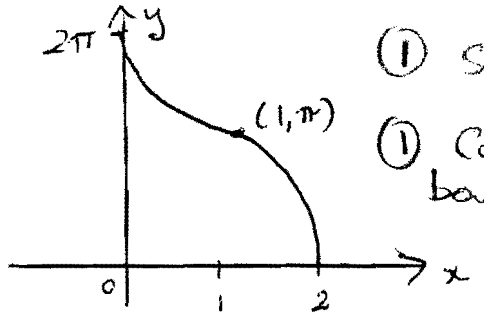
$\frac{y}{2} = \cos^{-1}(x-1)$

Domain $-1 \le x-1 \le 1$

$0 \le x \le 2$ (1)

Range $0 \le \frac{y}{2} \le \pi$

$0 \le y \le 2\pi$ (1)



(1) shape

(1) Correct boundaries.

c) $2x^3 - 5x^2 - 3x + 1 = 0$

(i) $\alpha + \beta + \gamma = \frac{-b}{a} = \frac{5}{2}$ (1)

(ii) $\frac{1}{\alpha} + \frac{1}{\beta} + \frac{1}{\gamma} = \frac{\beta\gamma + \alpha\gamma + \alpha\beta}{\alpha\beta\gamma}$

$= \frac{-\frac{3}{2}}{-\frac{1}{2}}$

$= +3$ (1)

(iii) $\alpha^2 + \beta^2 + \gamma^2$

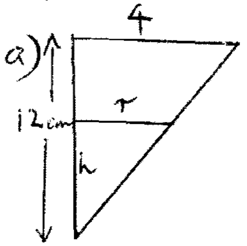
$= (\alpha+\beta+\gamma)^2 = \alpha^2 + \beta^2 + \gamma^2 + 2(\alpha\beta + \alpha\gamma + \beta\gamma)$ (1)

$\therefore \alpha^2 + \beta^2 + \gamma^2 = (\alpha+\beta+\gamma)^2 - 2(\alpha\beta + \alpha\gamma + \beta\gamma)$

$= \left(\frac{5}{2}\right)^2 - 2\left(-\frac{3}{2}\right)$

$= \frac{37}{4}$ (1)

4 a)



(i)

$\frac{h}{12} = \frac{r}{4}$

$r = \frac{4}{12}h$

$r = \frac{1}{3}h$ (1)

(ii) Find $\frac{dh}{dt}$ when $h = 9$.

$V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3}\pi \cdot \left(\frac{h}{3}\right)^2 \cdot h$.

$= \frac{\pi h^3}{27}$ (1)

given $\frac{dV}{dt} = 3$

$\frac{dV}{dh} = \frac{3\pi h^2}{27}$

$= \frac{\pi h^2}{9}$.

$\frac{dV}{dt} = \frac{dV}{dh} \cdot \frac{dh}{dt}$

$3 = \frac{\pi \cdot 9^{\cancel{2}}}{\cancel{9}} \cdot \frac{dh}{dt}$ (1)

$\frac{dh}{dt} = \frac{3}{9\pi}$

$= \frac{1}{3\pi}$ cm/s. (1)

b) $x^2 = 4ay$

(i) $y = \frac{x^2}{4a}$

$y' = \frac{2x}{4a}$

at $x = 2ap$ $y' = p$ (ie $m = p$) (1) must show working

Tangent $y - ap^2 = p(x - 2ap)$

$y = px - ap^2$ (1)

(ii) at T $y = 0$ $\therefore 0 = px - ap^2$

$x = ap$

$T(ap, 0)$ (1)

(iii) Eq'n of normal

$y - ap^2 = -\frac{1}{p}(x - 2ap)$

$y = -\frac{x}{p} + ap^2 + 2a$ (1)

(iv) at R

$x = ap$ $\therefore y = -\frac{a\cancel{p}}{\cancel{p}} + ap^2 + 2a$

$= ap^2 + a$ (1)

$R(ap, ap^2 + a)$

(v) $x = ap \Rightarrow p = \frac{x}{a}$

$y = ap^2 + a$

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

$y = \frac{x^2}{a} + a$ not essential to state its in the form $y = ax^2 + bx + c$

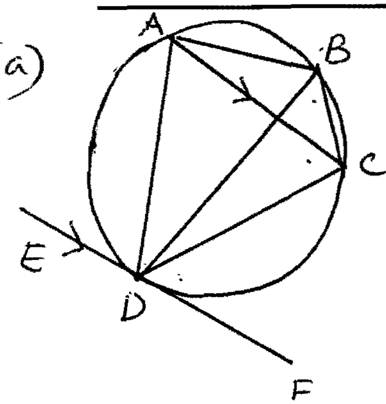
$x^2 = ay - a^2$

$x^2 = a(y - a)$ (1)

Vertex $(0, a)$ focal length $\frac{a}{4}$

$\therefore$ directrix $y = \frac{3a}{4}$ (1)

5a)



let $\angle CDF = x°$ (1)

$\therefore \angle DBC = x°$ (Angle between tangent & chord is equal to the angle in the alternate segment)

$\angle ACD = x°$ (Alternate $\angle$'s on $\parallel$ lines. (1)

$\angle ABD = x°$ (Angles at circumference on the same arc are equal) (1)

$\therefore \angle ABD = \angle DBC$ $\therefore$ BD bisects $\angle ABC$.

5b) $v^2 = -9x^2 + 18x + 27$

(i) $\frac{1}{2}v^2 = -\frac{9x^2}{2} + 9x + \frac{27}{2}$

$\frac{d}{dx}\left(\frac{1}{2}v^2\right) = -9x + 9$ (1)

ie $\ddot{x} = -9(x-1)$
which is in the form (1)

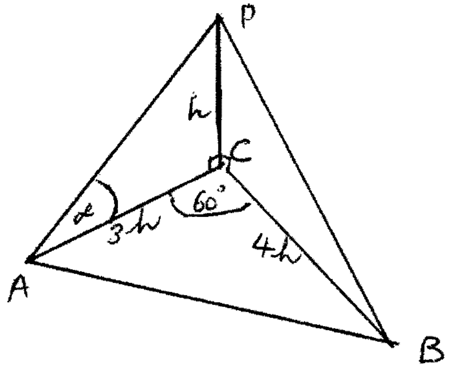
$\ddot{x} = -n^2(x-b)$ in SHM.

(ii) $T = \frac{2\pi}{n} = \frac{2\pi}{3}$ (1)

(iii) At endpoints $v = 0$

$\therefore -9x^2 + 18x + 27 = 0$
$x^2 - 2x - 3 = 0$
$(x-3)(x+1) = 0$ (1)
$x = -1, 3$

$\therefore$ Amplitude is $\frac{1}{2} \times 4 = 2$ (1)



(i) $\tan\alpha = \frac{h}{3h}$ (1)
$\tan\alpha = \frac{1}{3}$ $\therefore \alpha = 18°26'$

(ii) $(h+300)^2 = (3h)^2 + 4h^2 - 2.3h.4h.\cos 60°$ (1)
$(h+300)^2 = 9h^2 + 16h^2 - 24h^2 \cdot \frac{1}{2}$
$h^2 + 600h + 90000 = 13h^2$

$0 = 12h^2 - 600h - 90000$
$= h^2 - 50h - 7500$ (1)

$h = \frac{50 \pm \sqrt{(-50)^2 - 4 \times 1 \times -7500}}{2 \times 1}$

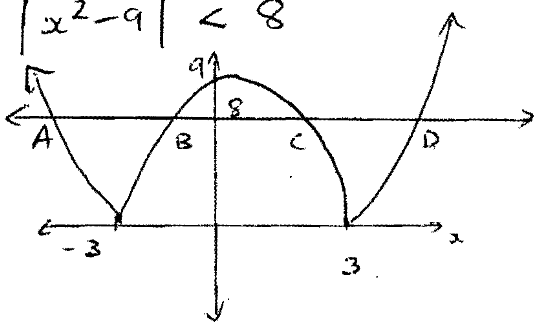
$= \frac{50 \pm \sqrt{32500}}{2}$ $h > 0$

$\therefore h = \frac{50 + \sqrt{32500}}{2}$
$= 115 \cdot 1$ m. (1)

Question 6

Graphically

a) $|x^2 - 9| < 8$



To find A & D. solve

$x^2 - 9 = 8$
$x = \pm\sqrt{17}$ (1)

To find BC $9 - x^2 = 8$
$x^2 = 1$
$x = \pm 1$ (1)

$\therefore |x^2 - 9| < 8$ when

$-\sqrt{17} < x < -1, \quad 1 < x < \sqrt{17}$ (1)

Algebraically.

$|x^2 - 9| < 8$ $\quad -(x^2 - 9) < 8$
$x^2 - 9 < 8$ $\quad -x^2 + 9 < 8$
$x^2 < 17$ $\quad -x^2 < -1$
$-\sqrt{17} < x < \sqrt{17}$ (1) $\quad x^2 > 1$ (1)
ie $x < -1, x > 1$

require intersection.

$-\sqrt{17} < x < -1 \quad 1 < x < \sqrt{17}$.
(1)

6 b)

$(1+x)^n = {}^nC_0 + {}^nC_1 x + {}^nC_2 x^2 + \dots + {}^nC_n x^n$

Integrating,

$\frac{(1+x)^{n+1}}{n+1} + c_1 = {}^nC_0 x + \frac{1}{2}{}^nC_1 x^2 + \dots + \frac{1}{n+1}{}^nC_n x^{n+1} + c_2$ ①

let $x=0$

$\therefore \frac{1}{n+1} + c_1 - c_2 = 0$

$\therefore c_1 - c_2 = -\frac{1}{n+1}$ ①

$\therefore \frac{(1+x)^{n+1}}{n+1} - \frac{1}{n+1} = {}^nC_0 x + \dots + \frac{1}{n+1}{}^nC_n x^{n+1}$

let $x=-1$

$\therefore 0 - \frac{1}{n+1} = -{}^nC_0 + \frac{1}{2}{}^nC_1 - \frac{1}{3}{}^nC_2 + \dots$

$\frac{1}{n+1} = {}^nC_0 - \frac{1}{2}{}^nC_1 + \frac{1}{3}{}^nC_2 + \dots \frac{(-1)^n}{n+1}{}^nC_n$ ①

c) Range occurs when $y=0$

$0 = -5t^2 + Vt\sin\theta$

$0 = t(-5t + V\sin\theta)$

$t = 0, \quad \frac{V\sin\theta}{5}$ ①

$x = Vt\cos\theta$

$= \frac{V \cdot V\sin\theta\cos\theta}{5}$

$= \frac{V^2 \cdot 2\sin\theta\cos\theta}{10}$ ①

$= \frac{V^2\sin 2\theta}{10}$

Max range when $\theta = 45^\circ$

$\left.\begin{aligned}\therefore R &= \frac{V^2\sin 90}{10}\\ &= \frac{V^2}{10}\end{aligned}\right\}$ ①

(ii) $2000 = \frac{V^2}{10}$

$V^2 = 20000$

$V = \sqrt{20000} \quad (V>0)$

$V = 100\sqrt{2}$ ①

Current horizontal velocity

$\dot{x} = V\cos\theta$

$= 100\sqrt{2} \cdot \frac{1}{\sqrt{2}}$

$= 100$

$\therefore$ New $\dot{x} = 100 + 30$

$= 130.$ ①

Currently $\dot{y} = -10t + V\sin\alpha$

$= 0 + 100\sqrt{2} \cdot \frac{1}{\sqrt{2}}$

$= 100$

This doesn't change.

$\therefore V^2 = 100^2 + 130^2$

$= 26900.$ ①

$\therefore$ New Range $= \frac{V^2}{10}$

$= 2690$ m.

$\therefore$ Increase in range $= 690$ m

Question 7.

a) (i) $\frac{d}{dx}(\tan x)^3 =$

$3(\tan x)^2 \cdot \sec^2 x$ ①

$\left.\begin{aligned}&= 3\tan^2 x\,(1+\tan^2 x)\\ &= 3\tan^2 x + 3\tan^4 x\end{aligned}\right\}$ ①

(ii) $\frac{d}{dx}(\tan^3 x) = 3\tan^2 x + 3\tan^4 x$

$\therefore \tan^4 x = \frac{1}{3}\left[\frac{d}{dx}(\tan^3 x) - 3\tan^2 x\right]$ ①

$\therefore \int \tan^4 x = \frac{1}{3}\int \frac{d}{dx}(\tan^3 x) - 3\tan^2 x$ ①

$= \frac{1}{3}\int \frac{d}{dx}(\tan^3 x) - 3(\sec^2 x - 1)$

$\left.\begin{aligned}&= \frac{1}{3}\left[\tan^3 x - 3\tan x + 3x\right] + c\\ &= \frac{\tan^3 x}{3} - \tan x + x + c\end{aligned}\right\}$ ①

b) Prove by M. I.

$3\times2^2 + 3^2\times2^3 + \dots + 3^n\times2^{n+1} = \frac{12}{5}(6^n-1)$

Prove true for n=1

ie $3^1.2^{1+1} = \frac{12}{5}(6^1-1)$

$3\times2^2 = \frac{12}{5}\times5$

$12=12$

∴ True for n=1

Assume true for n=k (1)

ie

$3\times2^2+\dots+3^k\times2^{k+1} = \frac{12}{5}(6^k-1)$

Prove true for n=k+1 (1)

ie

$\underbrace{3\times2^2+\dots+3^k\times2^{k+1}} + 3^{k+1}\times2^{k+2} = \frac{12}{5}(6^{k+1}-1)$

ie $\frac{12}{5}(6^k-1) + 3^{k+1}\times2^{k+2} = \frac{12}{5}(6^{k+1}-1)$

LHS =

$\frac{12}{5}(6^k) - \frac{12}{5} + 3.3^k\times2^k.2^2$ (1)

$\frac{12}{5}(6^k) - \frac{12}{5} + 12.6^k$

$\frac{2.6.6^k}{5} - \frac{12}{5} + 2.6.6^k$

$\frac{2}{5}.6^{k+1} - \frac{12}{5} + 2.6^{k+1}$

$= \frac{2}{5}.6^{k+1} - \frac{12}{5} + \frac{10.6^{k+1}}{5}$

$= \frac{12}{5}.6^{k+1} - \frac{12}{5}$

$= \frac{12}{5}(6^{k+1}-1)$ (1)

= RHS.

Proved true for n=1 & assumed true for n=k. Proven true for n=k+1 ∴ true for n=1, n=2 ... & for all n by M.I.

7c) $^nC_2\,a^2 = 264$

$\frac{n(n-1)}{2}a^2 = 264$ ... (A)

(1) $^nC_3\,a^3 = 1760$.

∴ $\frac{n(n-1)(n-2)}{1\times2\times3}a^3 = 1760$ ... (B)

sub (1) into (2)

$264\frac{(n-2)a}{3} = 1760$

$88(n-2)a = 1760$

$(n-2)a = 20$

$(n-2) = \frac{20}{a}$ ... (1)

now n is a pos. integer

∴ a = 1, 2, 4, 5, ~~10~~, ~~20~~

& n = 22, 12, 7, 6, ~~4~~, ~~1~~.

but n > a ∴

trial a = 1, 2, 4, 5.

sub a = 1 n = 22 into (A)

$\frac{22(21)}{2}.1 \neq 264$

a = 2 n = 12

$\frac{12(11)}{2}.2^2 = 264$ ✓

∴ a = 2 n = 12. (1)

There are other methods of doing this...