MATHAMATICS P2 HG

ANALYTICAL GEOMETRY

QUESTION 1 [25]

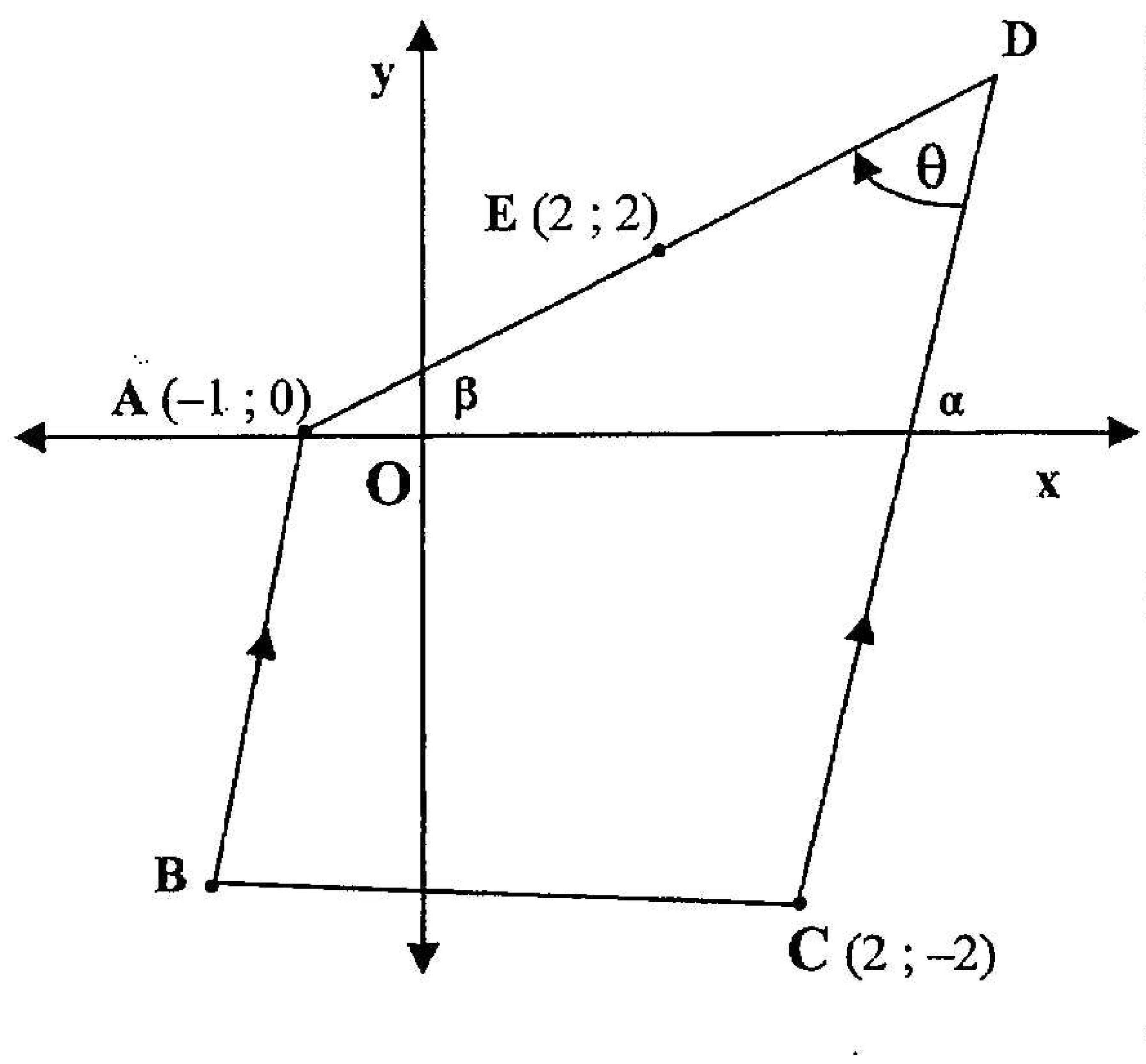
1.1

$\frac{x-1}{2} = 2$ and $\frac{y+0}{2} = 2$

$x - 1 = 4$ $\therefore\ y = 4$ ✓ A

$\therefore x = 5$ ✓ A

$\therefore$ D (5 ; 4) (2)



1.2

$m_{AD} = \tan\beta = \frac{4-0}{5+1} = \frac{4}{6} = \frac{2}{3}$ ✓ M ✓ CA

$\beta = 33{,}7°$ ✓ CA

$m_{CD} = \tan\alpha = \frac{4+2}{5-2} = \frac{6}{3} = 2$ ✓ CA

$\alpha = 63{,}4°$ ✓ CA

$\theta = 63{,}4° - 33{,}7°$

$= 29{,}7°$ ✓ CA (6)

OR

$m_{AE} = \tan\beta = \frac{2-0}{2+1} = \frac{2}{3}$ ✓ M ✓ CA

1.3

$3\ AB = DC$

$9[(x+1)^2 + (y+0)^2] = [(5-2)^2 + (4+2)^2]$ ✓ M ✓ A

$9[(x+1)^2 + y^2] = 9 + 36$

$9[(x+1)^2 - y^2 = 45$ ……(1)

$(x+1)^2 + y^2 = 5$ ✓ A

AB || DC $\therefore\ \frac{y-0}{x+1} = 2$ ✓ CA

$y = 2x + 2$ ……(2) ✓ CA

Subst. (2) into (1):

$(x+1)^2 + (2x+2)^2 = 5$ ✓ CA

$x^2 + 2x + 1 + 4x^2 + 8x + 4 = 5$

$5x^2 + 10x = 0$ ✓ CA

$5x(x+2) = 0$

$x = 0$ or $x = -2$ ✓ CA

NA

If $x = -2$, $y = -2$
$\therefore$ B (–2 ; –2) ✓ CA (9)

1.4

Eq . of perp. bisector of BC: $x = 0$

Midpt of AC: $(\frac{-1+2}{2}; \frac{0-2}{2})$ ✓ CA

$= (\frac{1}{2}; -1)$ ✓ A ✓ A

$m_{AC} = \frac{0+2}{-1-2} = -\frac{2}{3}$ ✓ A

$\therefore m_{perp.bisector} = \frac{3}{2}$ ✓ CA

Eq. perp. bisector: $y + 1 = \frac{3}{2}(x - \frac{1}{2})$ ✓ CA

$y = \frac{3}{2}x - \frac{3}{4} - 1$

$= \frac{3}{2}x - \frac{7}{4}$ ✓ CA

H: For $x = 0$: $y = \frac{3}{2}(0) - \frac{7}{4} = -1\frac{3}{4}$ ✓ CA

$\therefore$ H$(0 ; -\frac{7}{4})$ (8)

Eq. of AB: $y - 0 = 2(x+1)$

$y = 2x + 2$ ✓ CA

Midpt of AB: $(\frac{-1-2}{2}; \frac{0-2}{2}) = (-\frac{3}{2}; -1)$ ✓ A ✓ A

$m_{AB} = 2$ ✓ A

$\therefore m_{perp.bisector} = -\frac{1}{2}$ ✓ CA

Eq. perp. bisector: $y + 1 = -\frac{1}{2}(x + \frac{3}{2})$ ✓ CA

$y = -\frac{1}{2}x - \frac{7}{4}$ ✓ CA

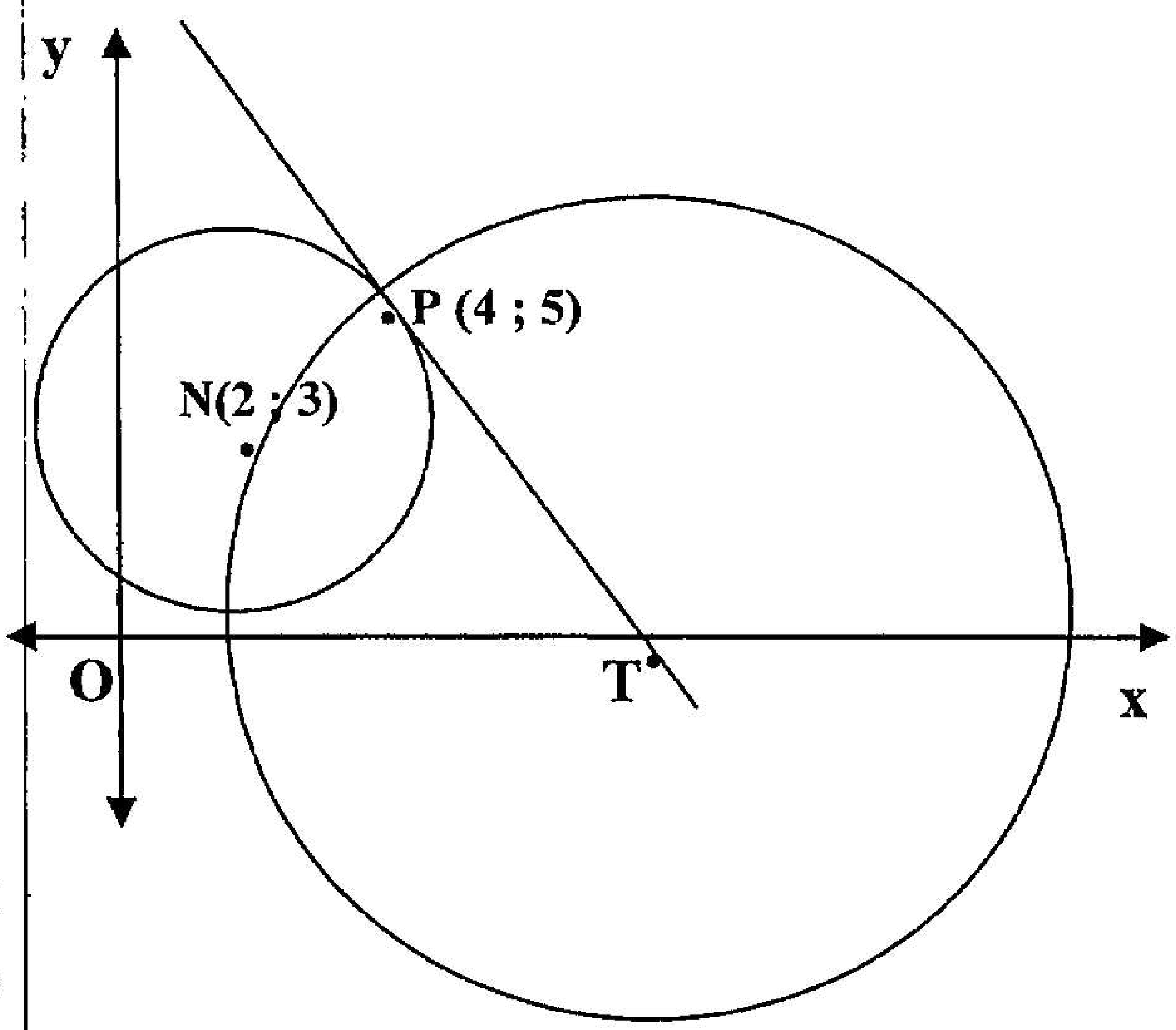
H: $-\frac{1}{2}x - \frac{7}{4} = \frac{3}{2}x - \frac{7}{4}$

$-2x - 7 = 6x - 7$

$-8x = 0$

$x = 0$ and $y = -1\frac{3}{4}$ ✓ CA

$\therefore$ H$(0 ; -\frac{7}{4})$ (8)

QUESTION 2		[22]
2.1.1	$NP^2 = (2-4)^2 + (3-5)^2$ $= 4 + 4$ ✓ M $= 8$ ✓ CA Equation of circle N: $(x-2)^2 + (y-3)^2 = 8$ ✓ M ✓ CA (4)	
2.1.2	$m_{PN} = \frac{5-3}{4-2} = \frac{2}{2} = 1$ ✓ A $\therefore m_{PT} = -1$ ✓ A Equation PT: $y - 5 = -1(x - 4)$ ✓ CA $y = -x + 9$ ✓ CA x-intercept: $x = 9$ $\therefore T(9 ; 0)$ } ✓ CA ✓ CA ✓ M	**OR** T lies on x-axis: (t;0) $NP^2 + PT^2 = NT^2$ ✓ A ✓ CA ✓ A $8 + [(5)^2 + (4-t)^2] = (3 - 0)^2 + (2-t)^2$ $8 + 25 + 16 - 8t + t^2 = 9 + 4 - 4t + t^2$ ✓ CA $4t = 36$ $t = 9$ } ✓ CA $\therefore T(9 ; 0)$ (5)
2.1.3	$r^2 = (9-4)^2 + (-5)^2 = 50$ Area of circle $= \pi r^2$ ✓ M $= \pi(50)$ ✓ CA $= 157$ units² ✓ CA (5)	
2.2.1	$m_{PQ} = \frac{y-4}{x-2}$ ✓ M and $m_{PR} = \frac{y+4}{x+4}$ ✓ A $\therefore \frac{y-4}{x-2} \cdot \frac{y+4}{x+4} = -1$ ✓ M $y^2 - 16 = -(x^2 + 2x - 8)$ ✓ CA $y^2 = -x^2 - 2x + 24$ (5) ✓ CA	**OR** Midpt QR $= (\frac{2-4}{2} ; \frac{4-4}{2})$ ✓ M $= (-1; 0)$ ✓ A $r = \sqrt{(2+1)^2 + (4)^2}$ $= \sqrt{25} = 5$ ✓ CA $\therefore (x+1)^2 + (y)^2 = 25$ ✓ CA ✓ M
2.2.2	✓ CA ✓ M ✓ CA For $\therefore -6 \leq x \leq 4$ (3)	

TRIGONOMETRY

QUESTION 3 [26]

3.1.

$$\frac{\cos^2 208^\circ}{\tan 242^\circ.\cos 28^\circ}\ .\ \text{cosec } 928^\circ.\ \cot(-120^\circ).(\sec 30^\circ)\ ✓\text{A}$$

$$= \frac{\cos^2 28^\circ\ ✓\text{A}}{\tan 62^\circ.\cos 28^\circ\ ✓\text{A}}.(-\text{cosec } 28^\circ)\ ✓\text{A}\ .\cot 60^\circ\ ✓\text{A}.\ \frac{2}{\sqrt{3}}\ ✓\text{A}$$

$$= -\frac{\cos 28^\circ}{\cot 28^\circ\ ✓\text{A}\ .\sin 28^\circ\ ✓\text{CA}}.\frac{1}{\sqrt{3}}\ ✓\text{A}\ .\ \frac{2}{\sqrt{3}}$$

$$= -\frac{\cos 28^\circ}{\frac{\cos 28^\circ}{\sin 28^\circ}.\sin 28^\circ}\ .\ \frac{2}{3}\quad ✓\text{CA}$$

$$= -\frac{2}{3}\quad ✓\text{CA}$$

(10)

3.2.1

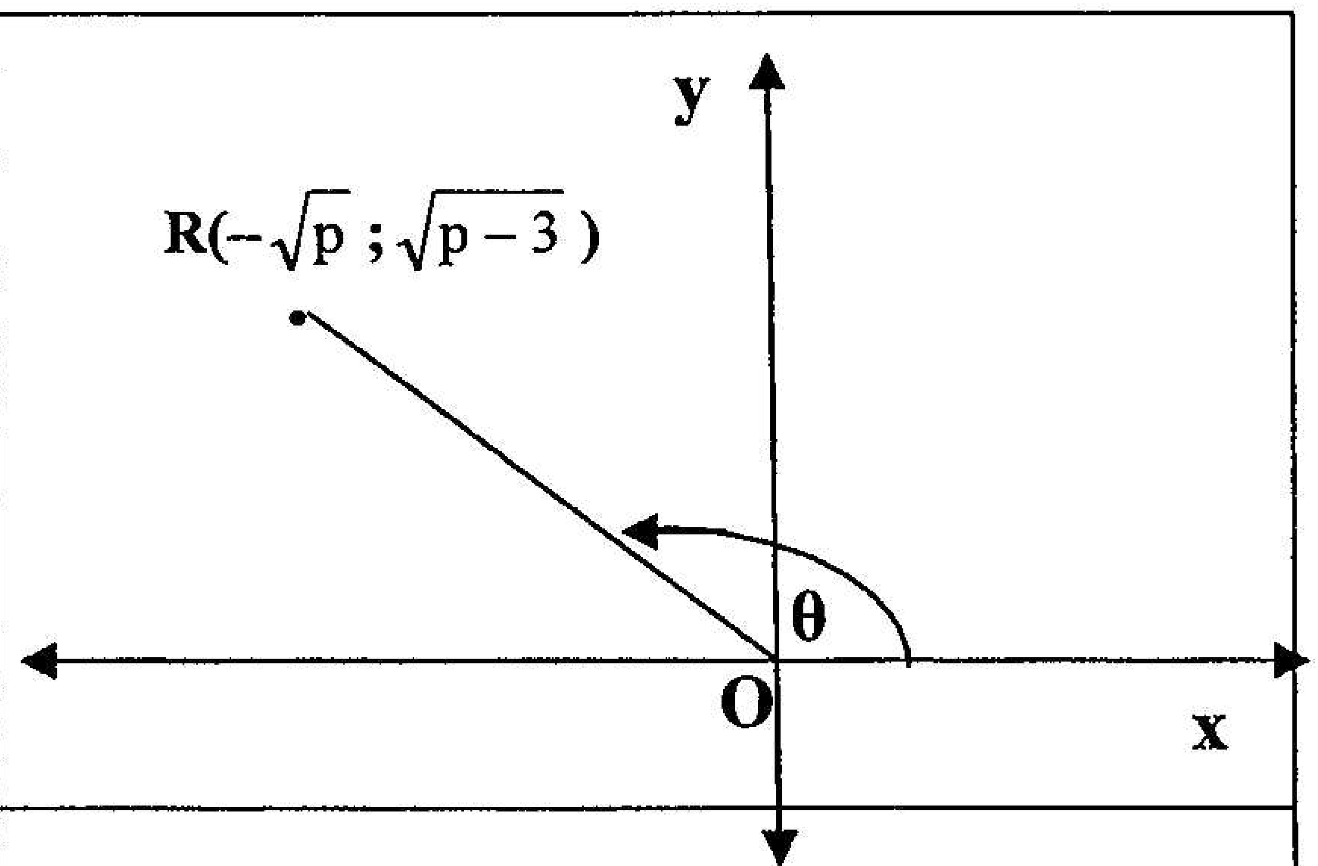
$r^2 = (-\sqrt{p})^2 + (\sqrt{p-3})^2$ ✓M

$= p + p - 3 = 2p - 3$

$r = \sqrt{2p-3}$ ✓A

$\sin^2 2 = \left(\frac{\sqrt{p-3}}{\sqrt{2p-3}}\right)^2$ ✓CA

$= \frac{p-3}{2p-3}$ ✓CA (4)

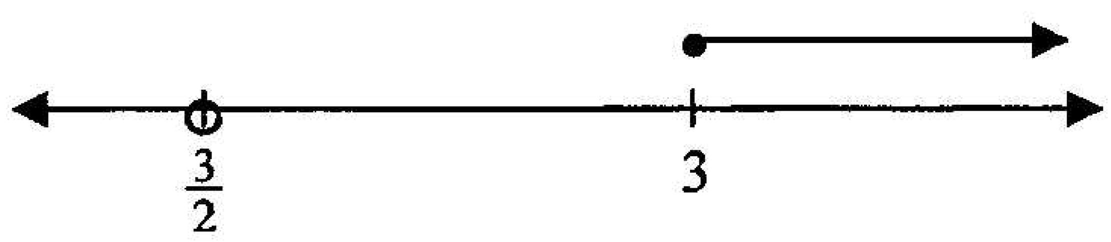


3.2.2

Def. for: $2p-3 \neq 0$ and $p - 3 \geq 0$

$p \neq \frac{3}{2}$ ✓M and $p \geq 3$ ✓M

$\therefore p \geq 3$ (2)



3.2.3

$\sec \alpha = -\sec \theta$ ✓A

$= -\left(\frac{\sqrt{2p-3}}{-\sqrt{p}}\right)$ ✓CA

$= \frac{\sqrt{2p-3}}{\sqrt{p}}$ ✓CA (3)

3.2.4

$\cos(\theta - 30^\circ) = \cos\theta.\cos 30^\circ + \sin\theta.\sin 30^\circ$ ✓A

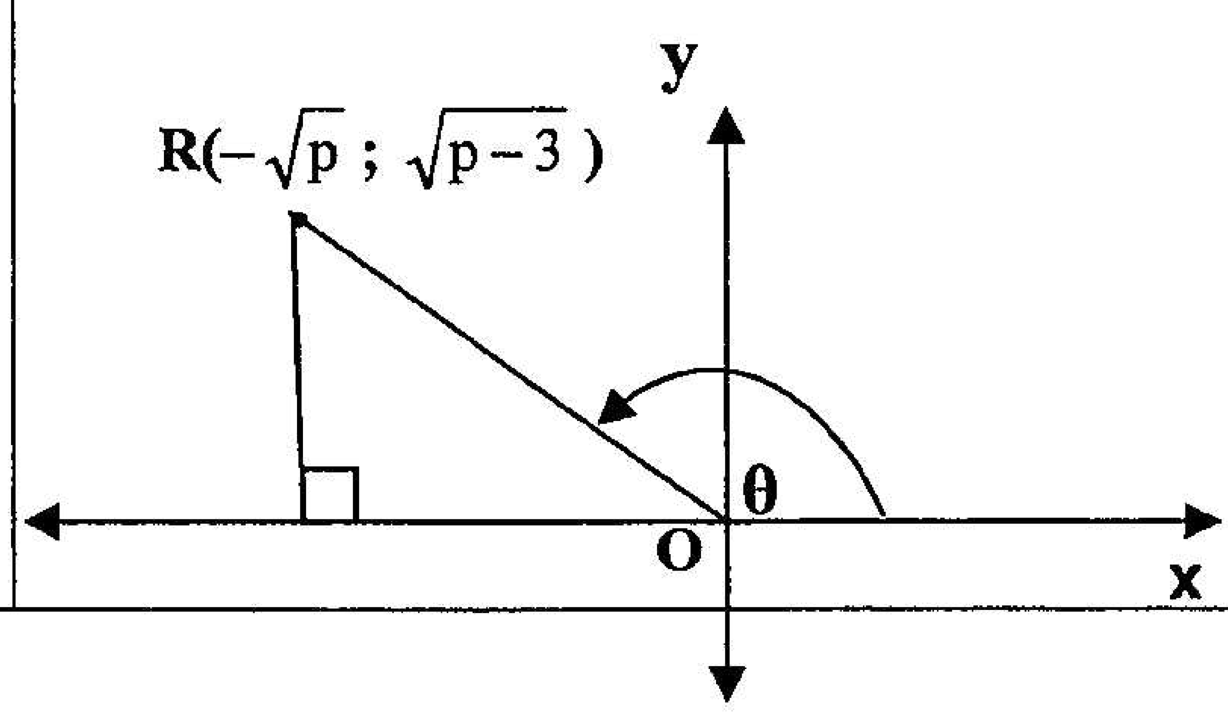
$= -\frac{\sqrt{6}}{3}.\frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{3}.\frac{1}{2}$ ✓A ✓A ✓A ✓A

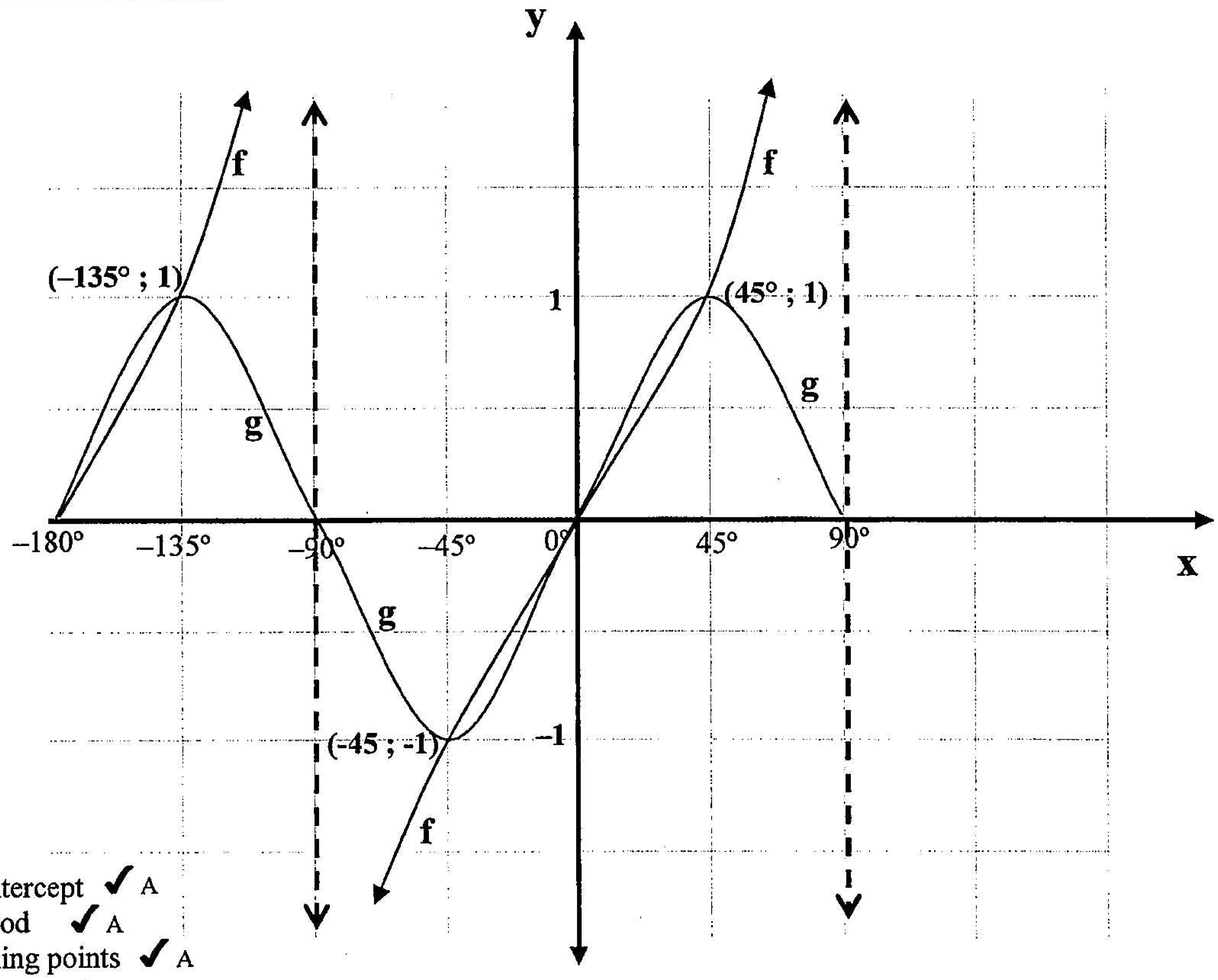
$= -\frac{\sqrt{18}}{6} + \frac{\sqrt{3}}{6}$ ✓CA

$= \frac{-3\sqrt{2} + \sqrt{3}}{6}$ ✓A (7)

$r^2 = (\sqrt{6})^2 + (\sqrt{3})^2$ or $r = \sqrt{2.6-3}$

$= 6 + 3 = 9$ $r = 3$



QUESTION 4		[28]
4.1.1	$\tan x = \sin 2x$ ✓A ✓A $\frac{\sin x}{\cos x} = 2 \sin x . \cos x$ $\sin x = 2 \sin x . \cos^2 x$ $0 = 2 \sin x . \cos^2 x - \sin x$ $0 = \sin x (2 \cos^2 x - 1)$ ✓A ✓CA $\therefore \sin x = 0$ or $2 \cos^2 x - 1 = 0$ ✓CA ✓CA $x = k.180°$ or $\cos x = \pm\sqrt{\frac{1}{2}}$ ✓CA $k \in Z$ ✓A $x = \pm 45° + k.90°$ ✓CA (9)	**OR** could be obtained from the graph. $0 = \sin x (2 \cos^2 x - 1)$ ✓A $0 = \sin x (\cos 2x)$ ✓CA $\therefore \sin x = 0$ or $1 - 2 \sin^2 x = 0$ ✓CA ✓CA $x = k.180°$ or $\sin x = \pm\sqrt{\frac{1}{2}}$ ✓CA $k \in Z$ ✓A $x = \pm 45° + k.90°$ ✓CA
4.1.2	✓CA ✓CA ✓CA $x = -180°$; $x = -135°$; $x = -45°$ (3)	
4.2	 g: x-intercept ✓A period ✓A turning points ✓A shape ✓A f: both asymptotes ✓A 45°, –135°, –45° ✓A intercepts ✓A shape ✓A (8)	
4.3.1	$\therefore \tan x \geq \sin 2x$ ✓M ✓A $x \in [-135° ; -90°)$ or $x \in [-45° ; 0°]$ ✓A ✓M (4)	
4.3.2	$x \in (-45° ; 0°)$ and $x \in (0° ; 45°)$ ✓A ✓M ✓M ✓A (4)	**OR** $x \in (-45°; 45°)$, $x \neq 0°$ ✓A ✓M ✓A ✓M

Question 5			[11]
5.1	$\tan 2\alpha = \dfrac{2\tan\alpha}{1-\tan^2\alpha}$ ✓M	(1)	
5.2.1	LHS: $\dfrac{1+\cos 2A}{\cos 2A} = \dfrac{1+(2\cos^2 A-1)}{\cos^2 A-\sin^2 A}$ ✓A ✓A $= \dfrac{2\cos^2 A}{\cos^2 A-\sin^2 A}$ ✓CA RHS: $\dfrac{\tan 2A}{\tan A} = \dfrac{2\tan A}{(1-\tan^2 A).\tan A}$ ✓M $= \dfrac{2}{(1-\dfrac{\sin^2 A}{\cos^2 A})}$ ✓A $= \dfrac{2\cos^2 A}{\cos^2 A-\sin^2 A}$ = LHS	(5)	Alternate Method: LHS: ✓M $\dfrac{1+\cos 2A}{\cos 2A} = \dfrac{1+2\cos^2 A-1}{\cos^2 A-\sin^2 A}$ ✓A $= \dfrac{2\cos^2 A}{\cos^2 A-\sin^2 A} \div \dfrac{\cos^2 A}{\cos^2 A}$ ✓A $= \dfrac{2}{1-\tan^2 A}$ ✓CA $\times \dfrac{\tan A}{\tan A}$ ✓CA $= \dfrac{\tan 2A}{\tan A}$ = RHS. (5)
5.2.2	Identity is **undefined** for: $\tan A = 0$ ✓M or $\cos 2A = 0$ ✓A $A = k.90°$ ✓A $2A = 90° + k.180°$ $k \in Z$ ✓A $A = 45° + k.90°$ ✓CA	(5)	

QUESTION 6 **[22]**

6.1

Draw QD ⊥ PR produced.

$r^2 = DP^2 + QD^2$ ✓A (Pythagoras)

$= (DR + q)^2 + QD^2$ ✓A

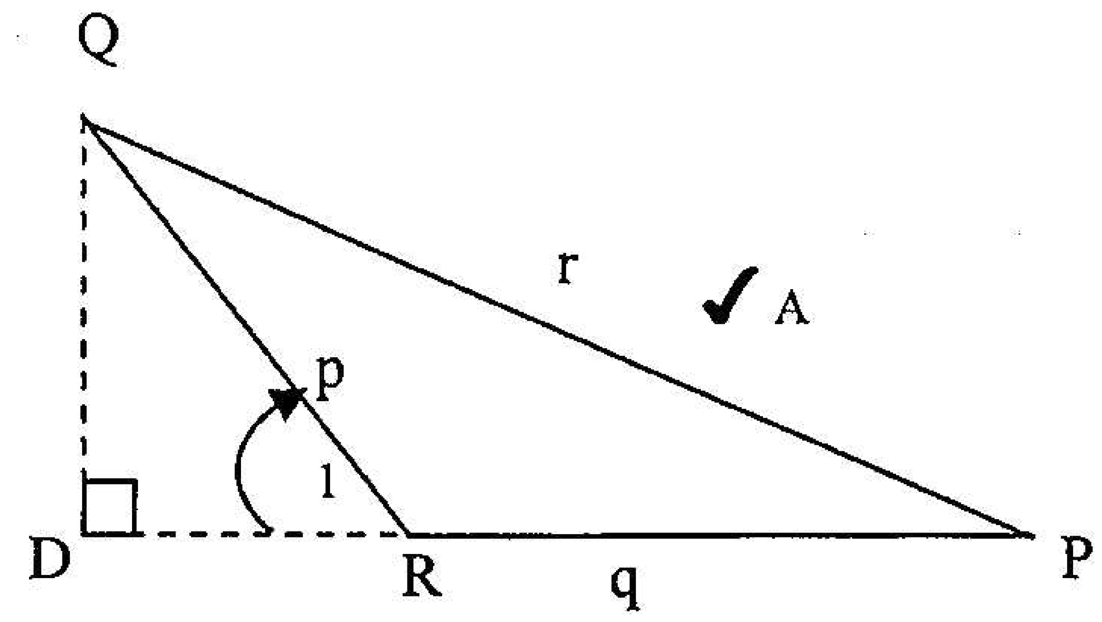
$= DR^2 + 2q.DR + q^2 + QD^2$

$= p^2 + q^2 + 2q.DR$ ✓CA (Pythagoras)

but $\frac{DR}{p} = \cos R_1 = \cos(180° - R) = -\cos R$ ✓CA

$\therefore DR = -p\cos R$ ✓A

$\therefore r^2 = p^2 + q^2 - 2pq\cos R$ (6)



OR

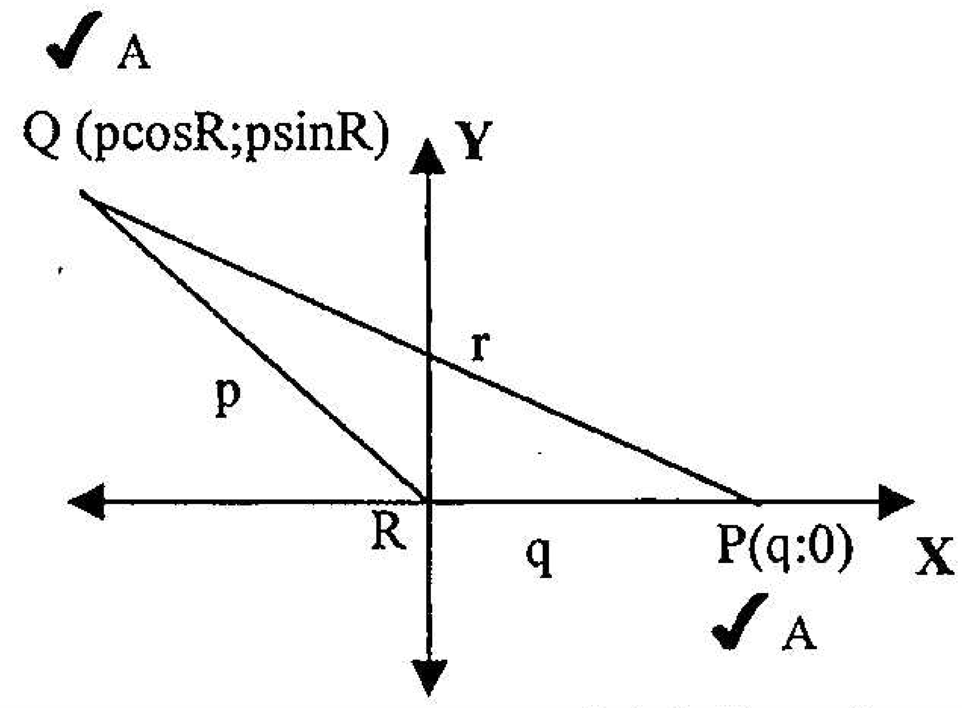
Draw Δ PQR with $\hat{R}$ at the origin and RP on the x-axis. ✓A

$r^2 = (p\cos R - q)^2 + (p\sin R)^2$ (distance formula) ✓CA

$= p^2\cos^2 R - 2pq\cos R + q^2 + p^2\sin^2 R$ ✓CA

$= p^2(\cos^2 R + \sin^2 R) - 2pq\cos R + q^2$ ✓A

$= p^2 + q^2 - 2pq\cos R$ ($\cos^2 R + \sin^2 R = 1$)



6.2.1

$AC^2 = d^2 + d^2 - 2d.d.\cos(180° - 2\alpha)$ ✓M ✓A

$= 2d^2 + 2d^2\cos 2\alpha$ ✓A

$= d^2(2 + 2\cos 2\alpha)$ ✓A

$\therefore AC = d\sqrt{2 + 2\cos 2\alpha}$

(4)

6.2.2

In Δ DCB: $\frac{d}{h} = \cot\theta$

$d = h\cot\theta$ ✓M

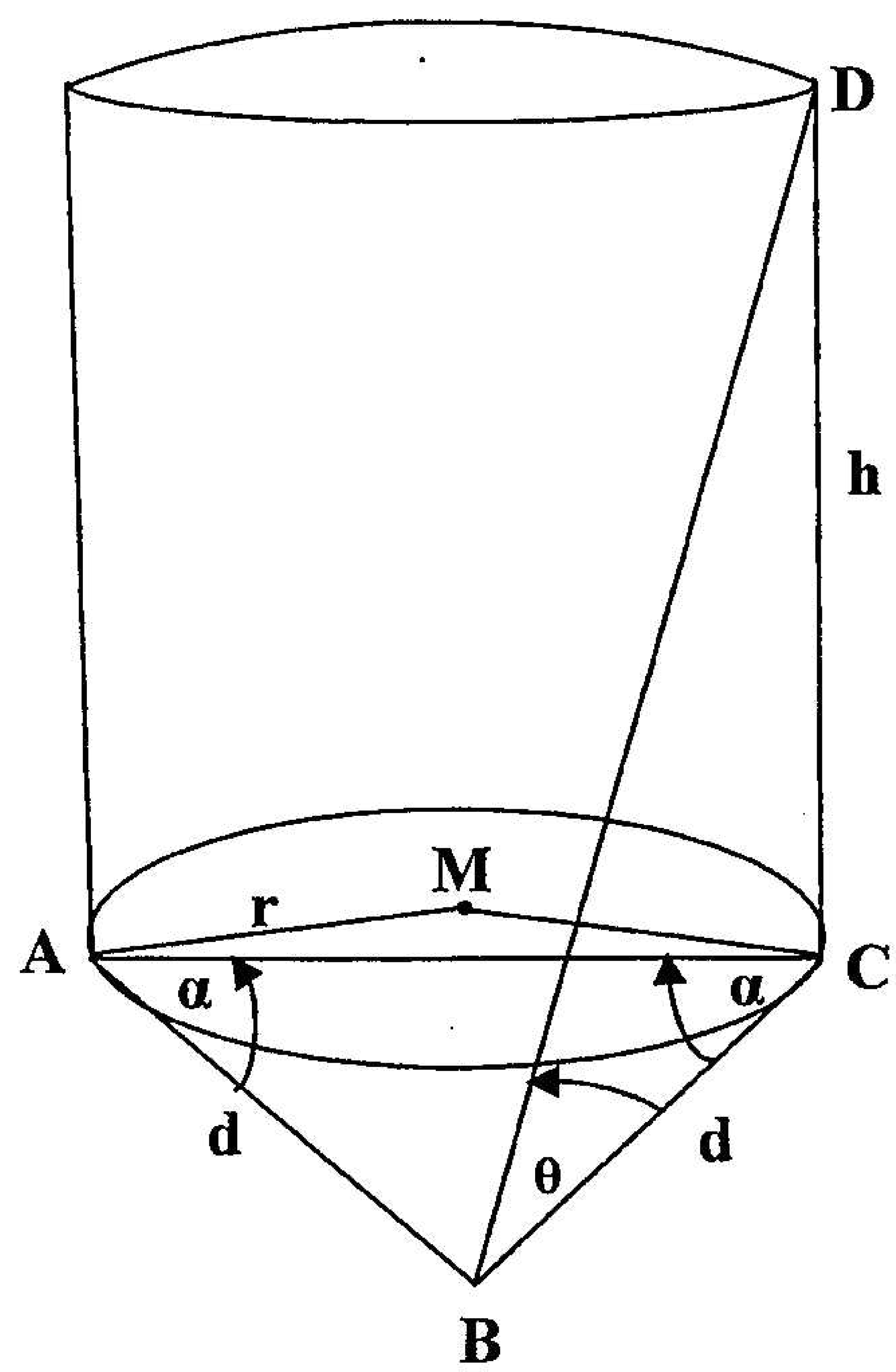
In ΔABC $\frac{AC}{\sin(180° - 2\alpha)} = \frac{d}{\sin\alpha}$ ✓M ✓A

$\therefore AC = \frac{h\cot\theta.\sin(180° - 2\alpha)}{\sin\alpha}$

$= \frac{h.\cot\theta.\sin 2\alpha}{\sin\alpha}$ ✓CA

$= \frac{h.\cot\theta.2\sin\alpha.\cos\alpha}{\sin\alpha}$ ✓CA

$= 2h.\cos\alpha.\cot\theta$ (5)



OR

AMCB is a kite

$\therefore AP = PC$, $\hat{P}_1 = 90°$ ✓M

In Δ PBC:

$\frac{PC}{d} = \cos\alpha$ ✓M

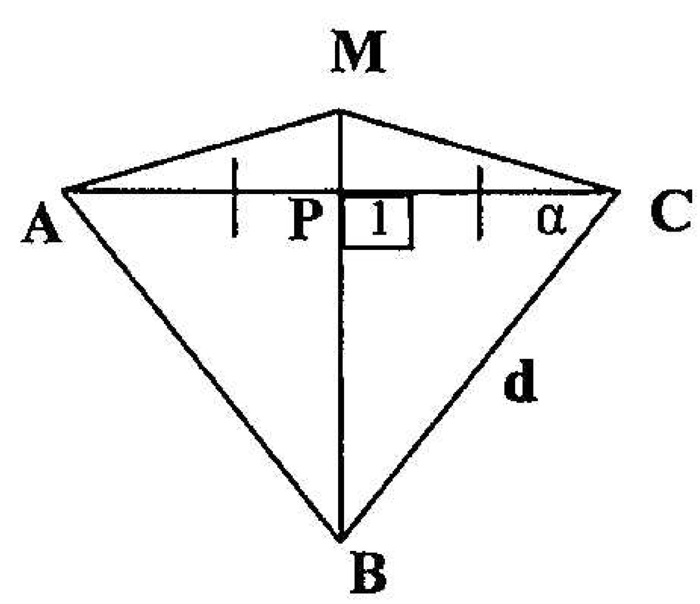
$\therefore PC = d\cos\alpha$ ✓A

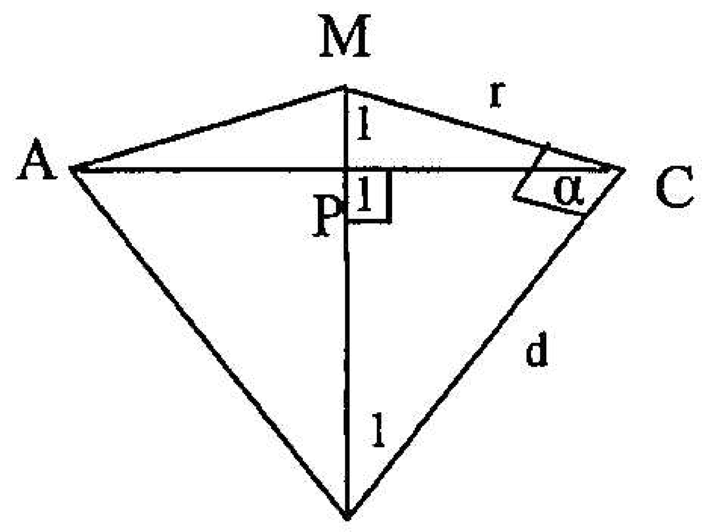
In Δ DCB: $\frac{d}{h} = \cot\theta$

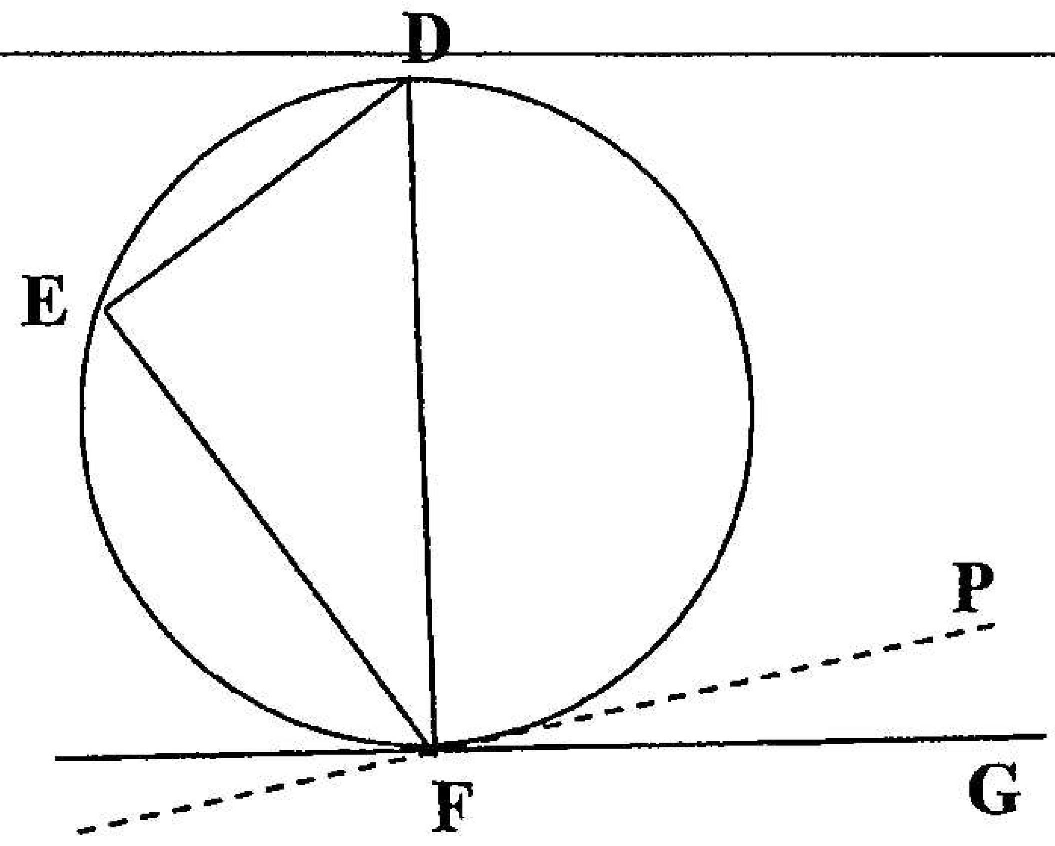
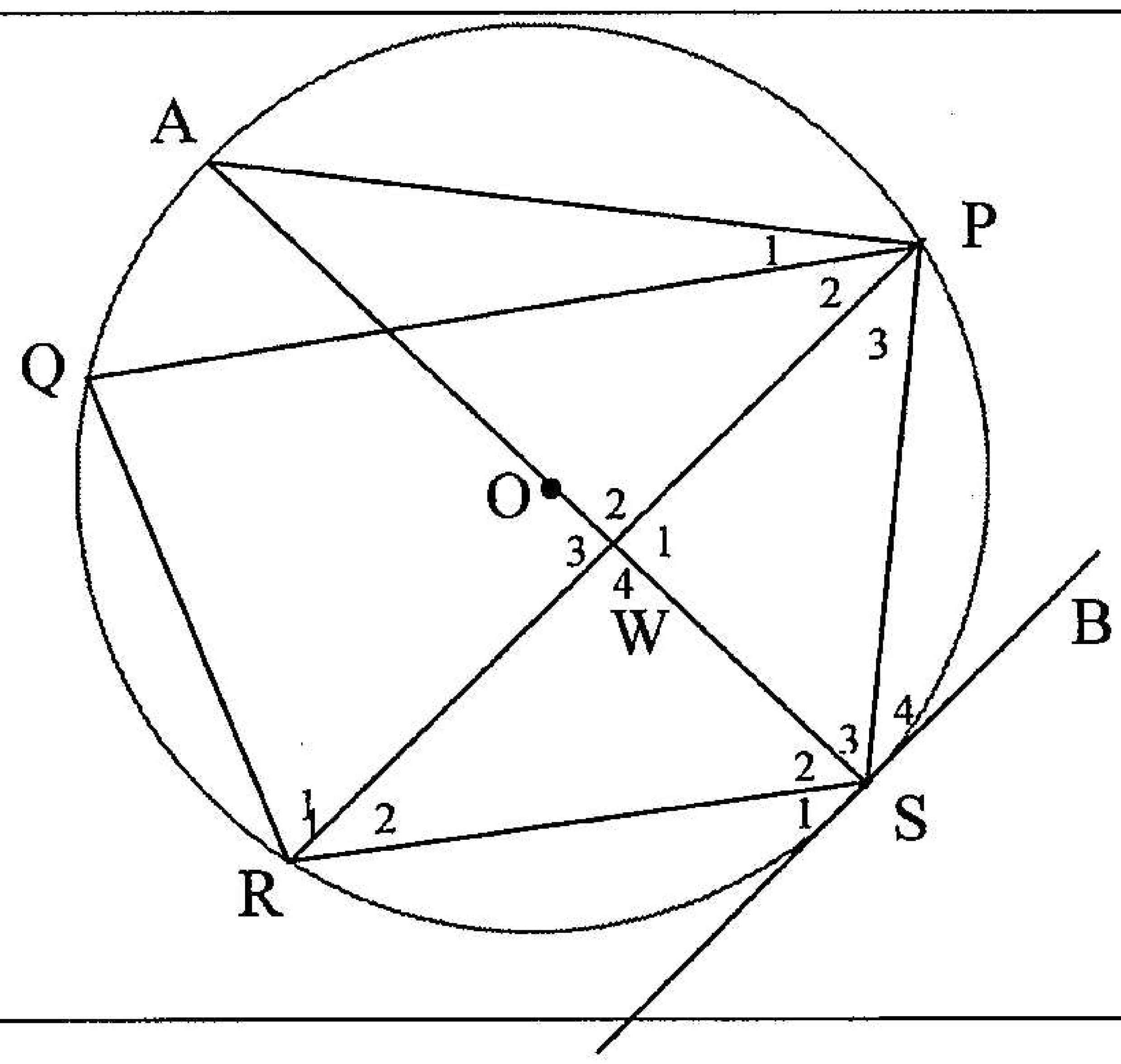
$d = h\cot\theta$ ✓CA

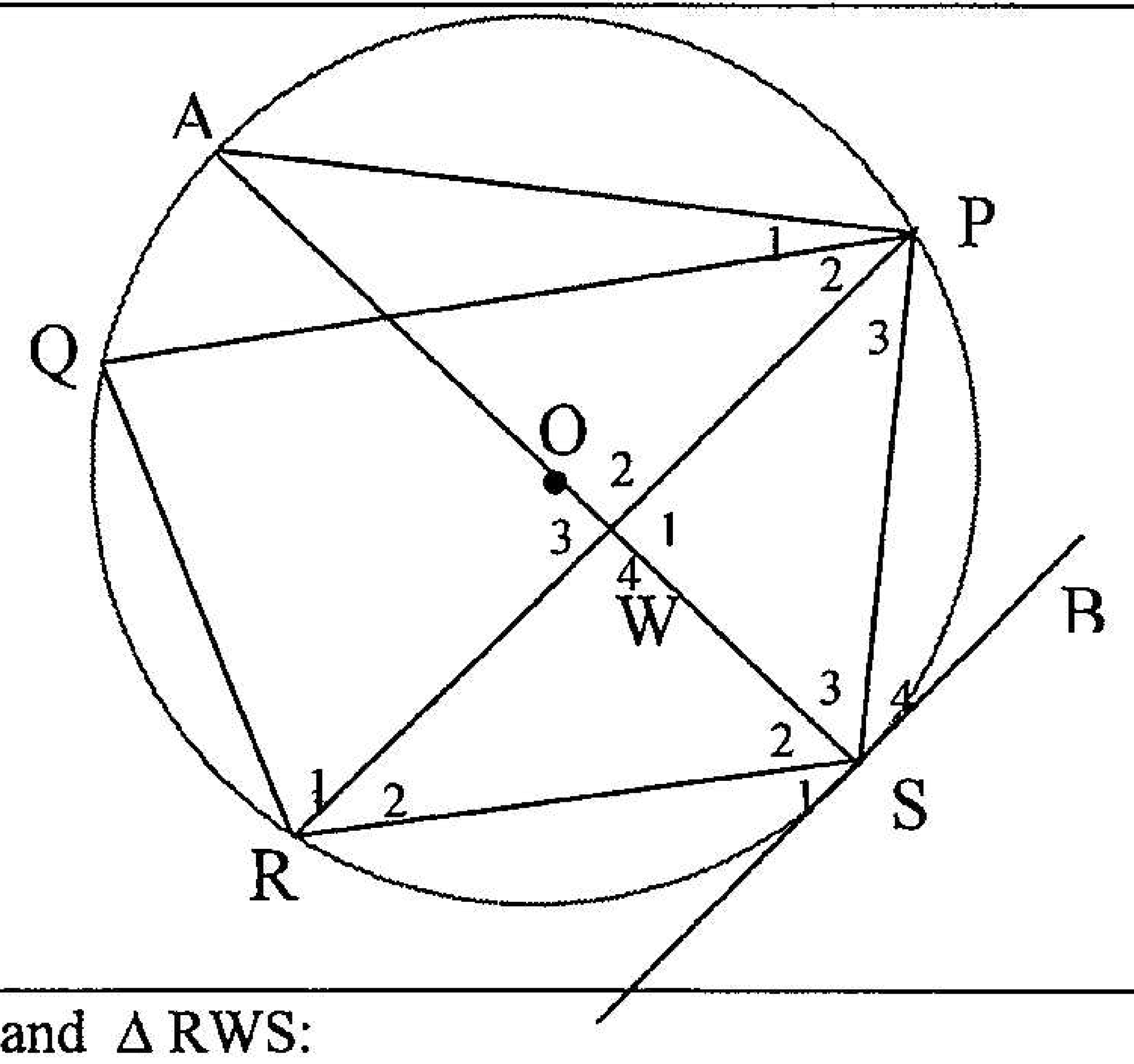
$\therefore AC = 2\,PC = 2.\,d.\cos\alpha$ ✓CA

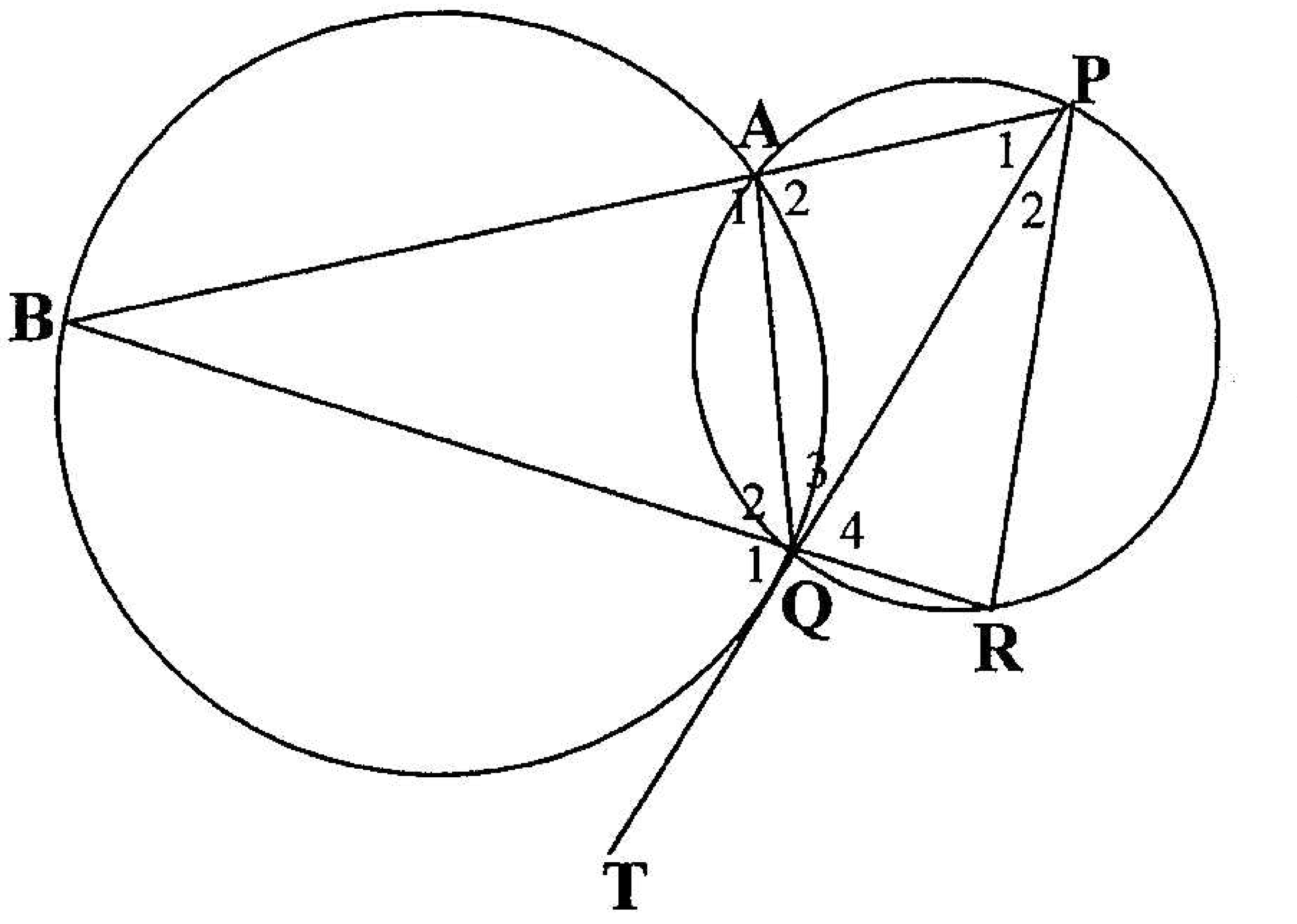
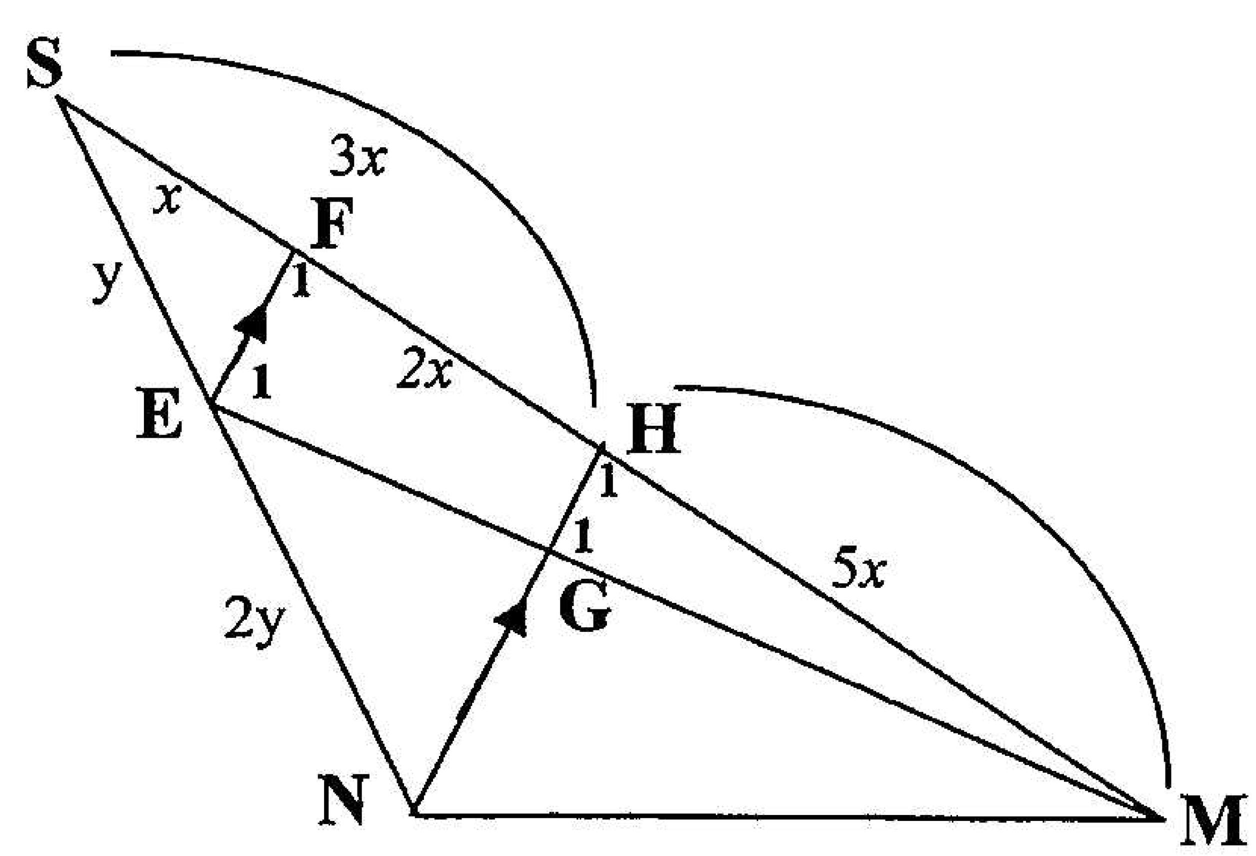
$= 2h.\cos\alpha.\cot\theta$ (5)

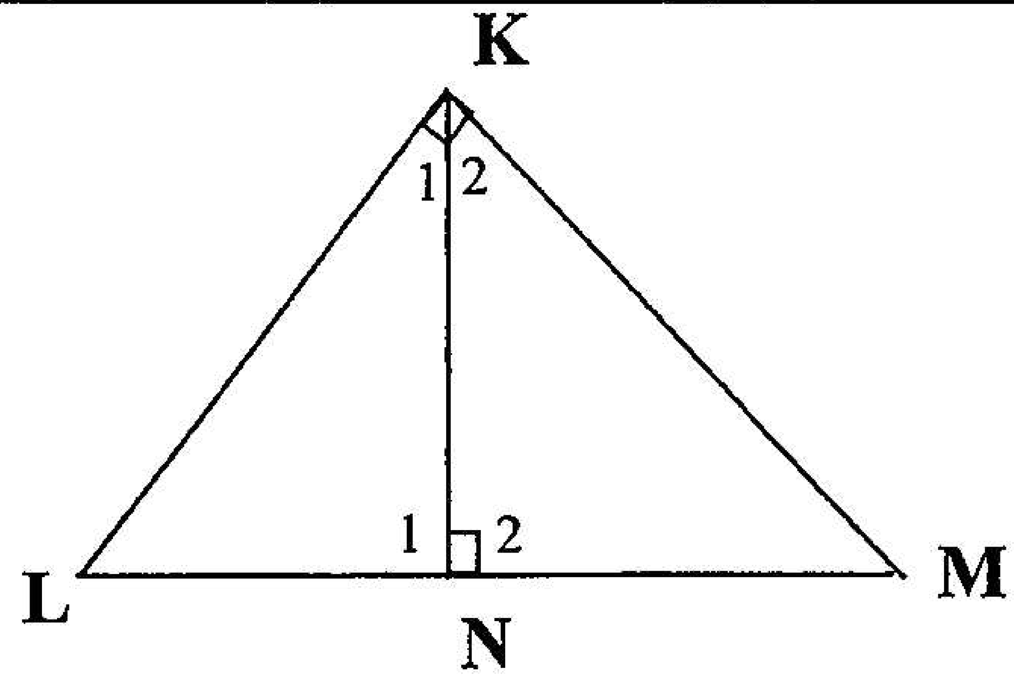
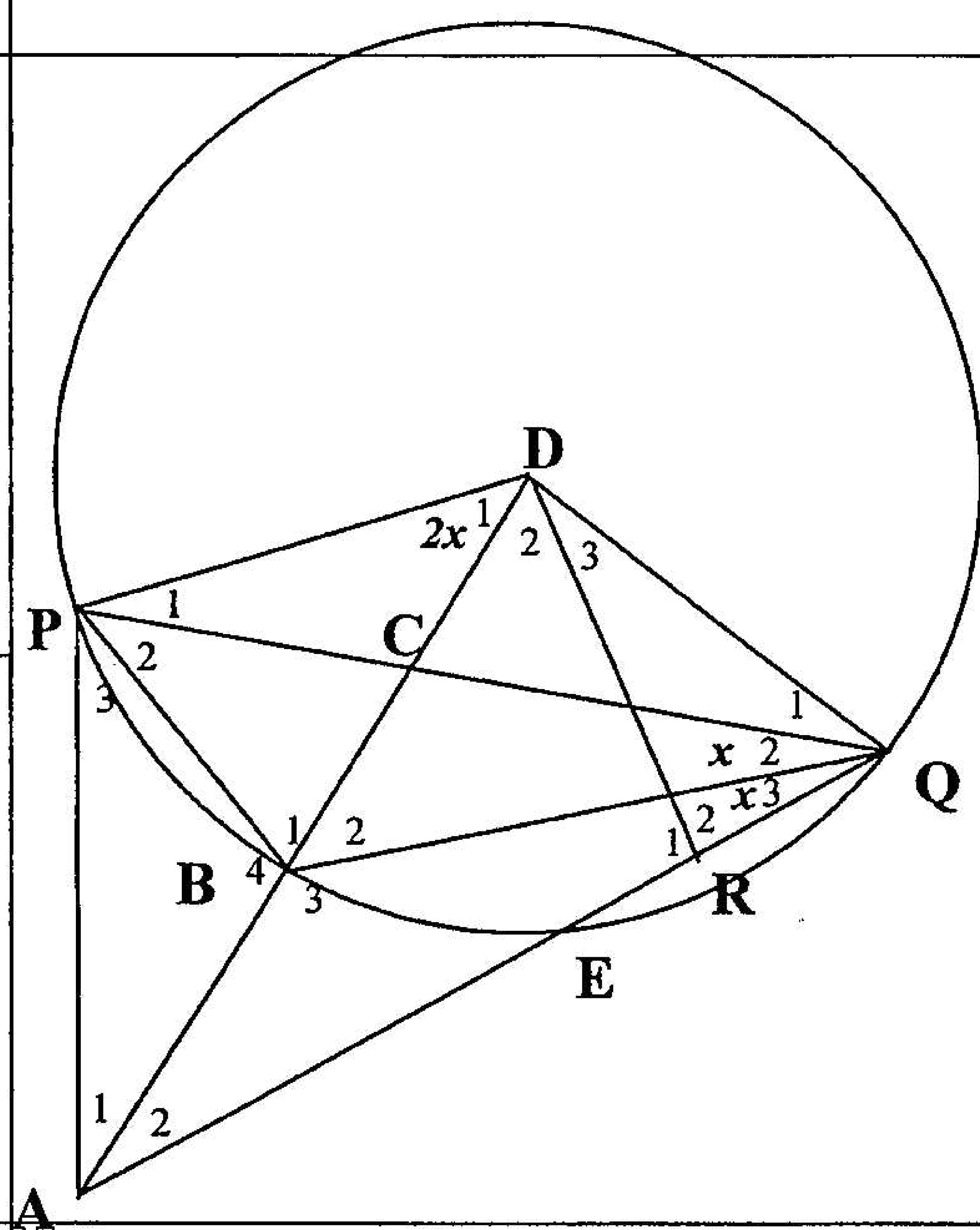


6.2.3	AMCB is a kite. $\therefore\ \hat{P}_1 = 90°$ $\therefore\ \hat{B}_1 = 90° - \alpha$ ✓M $M\hat{C}B = 90°$ ✓A BC is a tangent $\therefore\ \hat{M}_1 = 90° - (90° - \alpha)$ $= \alpha$ ✓A $\therefore\ \frac{r}{d} = \cot\alpha$ ✓M $r = d\cot\alpha$ ✓A $= 10{,}3\ (\cot 54°)$ $= 7{,}5$ **or** $7{,}48$ ✓CA Volume $= \pi r^2 h$ $= \pi\ (10{,}3\cot 54°)\ (36)\ m^3$ $= 6334\ m^3$ ✓CA (7)	**OR** ABCM is a cyclic quadrilateral ✓M $(M\hat{A}B = M\hat{C}B = 90°)$ ✓A $\therefore\ B\hat{M}C = \hat{M}_1 = \alpha$ ✓A ($\angle$s same segment)  [if r = 7,5: volume = 6362; if r = 7,48: volume = 6328]

QUESTION 7		[24]
7.1.1	✓ M If a line is drawn through the end point of a chord **making with the chord an angle equal to the angle in the alternate** ✓ M segment, **then the line is a tangent to the circle.** (2)	
7.1.2	Constr. Draw a tangent FP at F. ✓ M Proof: $D\hat{F}P = \hat{E}$ ✓ S (∠ between tan and chord) ✓ R But $D\hat{F}G = \hat{E}$ (Given) $\therefore\ D\hat{F}P = D\hat{F}G$ ✓ S and this is only true if FP and FG coincide. $\therefore$ FG is a tangent to circle FDE at F ✓ S (5)	
7.2		
7.2.1	$\hat{W}_1 = 90°$ ✓ S (line from centre to midpt of chord) ✓ R But $\hat{S}_3 + \hat{S}_4 = 90°$ ✓ S (radius ⊥ tangent) ✓ R $\hat{W}_1 + \hat{S}_3 + \hat{S}_4 = 180°$ $\therefore$ SB // RP (co-interior ∠s) ✓ R (5)	**or** $\hat{W}_2 = 90°$ ✓ S (line from centre to midpt of chord) ✓ R But $\hat{S}_3 + \hat{S}_4 = 90°$ ✓ S (radius ⊥ tangent) ✓ R $\therefore\ \hat{W}_2 = \hat{S}_3 + \hat{S}_4$ $\therefore$ SB // RP (corresp. ∠s equal) ✓ R (5)

7.2.2		
7.2.2	In Δ APS and Δ RWS: $\hat{P}_1 + \hat{P}_2 + \hat{P}_3 = 90°$ ($\angle$ in semi-circle) ✓ S/R $= \hat{W}_4$ ✓ S/R (line from centre to mdpt chord) $\hat{A} = \hat{R}_2$ ($\angle$s same segment) ✓ S/R $\therefore \hat{S}_3 = \hat{S}_2$ (sum $\angle$s of Δ) $\therefore \Delta$ APS /// ΔRWS ($\angle\angle\angle$) ✓ S/R $\therefore \frac{PS}{AS} = \frac{WS}{RS}$ ✓ S but ΔRWS $\equiv \Delta$PWS (S$\angle$S) ✓ S/R $\therefore$ RS = PS ✓ S $\therefore \frac{RS}{AS} = \frac{WS}{RS}$ ✓ S $\therefore RS^2 = WS.AS$ (8)	**OR** In ΔAPS and Δ PWS: $\hat{P}_1 + \hat{P}_2 + \hat{P}_3 = 90°$ ($\angle$ in semi-circle) ✓ S/R $= \hat{W}_1$ ✓ S/R (line from centre to mdpt chord) $\hat{S}_3 = \hat{S}_3$ (Common) ✓ S/R $\hat{A} = \hat{P}_3$ (sum $\angle$s of Δ) $\therefore \Delta$ APS /// ΔPWS ($\angle\angle\angle$) ✓ S/R $\therefore \frac{PS}{WS} = \frac{AS}{PS}$ ✓ S but ΔRWS $\equiv \Delta$PWS (S$\angle$S) ✓ S/R $\therefore$ RS = PS ✓ S $\therefore \frac{RS}{AS} = \frac{WS}{RS}$ ✓ S $\therefore RS^2 = WS.AS$ (8) **OR** In ΔAPS and ΔPWS: ✓ S/R $\hat{P}_1 + \hat{P}_2 + \hat{P}_3 = 90°$ ($\angle$ in semi-circle) $= \hat{W}_1$ ✓ S/R (line from centre to mdpt chord) ✓ S $\therefore \Delta$APS /// ΔPWS (perp. from rt $\angle$ to hyp) ✓ R $\therefore \frac{PS}{WS} = \frac{AS}{PS}$ ✓ S but ΔRWS $\equiv \Delta$PWS (S$\angle$S) ✓ S/R $\therefore$ RS = PS ✓ S $\therefore \frac{RS}{AS} = \frac{WS}{RS}$ ✓ S $\therefore RS^2 = WS.AS$ (8)
7.2.3	$RS^2 = RW^2 + WS^2$ ✓ S (Pythagoras) ✓ R and $RS^2 = WS.AS$ (Proven 7.2.2) $\therefore WS.AS = RW^2 + WS^2$ ✓ S $\therefore AS = \frac{RW^2}{WS} + WS$ ✓ S (4)	

QUESTION 8			[18]
8.1			
8.1.1	$\hat{R} = \hat{A}_1$ ✓S (ext. ∠ of cyclic quad.) ✓R $\hat{Q}_4 = \hat{Q}_1$ (vert. opp. ∠s ✓S/R But $\hat{A}_1 = \hat{Q}_1$ (∠ between tang and chord) ✓R $\therefore \hat{R} = \hat{Q}_4$ ✓S $\therefore$ PQ = PR (5)		
8.1.2	In ΔPAQ and Δ PQB $\hat{P}_1 = \hat{P}_1$ (common) ✓S/R $\hat{Q}_3 = \hat{B}$ (∠ between tan/ chord) ✓S/R $\hat{A}_2 = \hat{Q}_2 + \hat{Q}_3$ (sum ∠'s Δ) ✓S/R $\therefore$ ΔPAQ /// Δ PQB ✓S (∠, ∠, ∠) $\frac{PA}{PQ} = \frac{PQ}{PB}$ ✓S but PQ = PR ✓S (proven 8.1.1) $\therefore \frac{PA}{PR} = \frac{PR}{PB}$ ✓S which forms the geometrical sequence PA, PR and PB . (7)		
8.2	In Δ SNH: $\frac{SF}{FH} = \frac{SE}{EN}$ (line // one side of Δ) ✓S/R $= \frac{1}{2}$ ✓S (given 2 SE = EN) Let SF = x, then FH = 2x and HM = 5x In ΔGHM and ΔEFM: $G\hat{M}H = E\hat{M}F$ (common) ✓S/R $\hat{G}_1 = \hat{E}_1$ (corresp. ∠s EF // NH) ✓S/R $\therefore \hat{H}_1 = \hat{F}_1$ (sum ∠s Δ / corr. ∠s EF // NH) $\therefore$ ΔGHM /// ΔEFM (∠ ∠ ∠) ✓S/R $\therefore \frac{GH}{EF} = \frac{HM}{FM} = \frac{5x}{7x} = \frac{5}{7}$ ✓S (6)		

QUESTION 9		[24]
9.1	In Δ NLK and Δ KLM: $\hat{N}_1 = \hat{K}_1 + \hat{K}_2$ (Both = 90°) ✓ S/R $\hat{L} = \hat{L}$ (Common) ✓ S/R $\hat{K}_1 = \hat{M}$ (Sum ∠s of Δ) ✓ S/R ∴ Δ NLK ||| Δ KLM (∠∠∠) In Δ NMK and Δ KML: $\hat{N}_2 = \hat{K}_1 + \hat{K}_2$ (Both = 90°) ✓ S/R $\hat{M} = \hat{M}$ (Common) $\hat{K}_2 = \hat{L}$ (Sum ∠s of Δ) ∴ Δ NMK ||| Δ KML (∠∠∠) ✓ S/R ∴ Δ KLN ||| Δ MKN ||| Δ MLK (Both similar to Δ MLK) (5)	 **OR** Similarly ∴ Δ NMK ||| Δ KML (∠∠∠) ✓ S ✓ S
9.2.1	$\hat{D}_1 = 2(\hat{Q}_2)$ ✓ S (∠ at centre = 2 ∠s at circumf.) ✓ R But $\hat{Q}_2 + \hat{Q}_3 = 2(\hat{Q}_2)$ ($\hat{Q}_2 = \hat{Q}_3$ - given) ∴ $\hat{D}_1 = \hat{Q}_2 + \hat{Q}_3$ ✓ S ∴ DPAQ is a cyclic quadrilateral (equal angles subtended by same line segment) ✓ R (4)	
9.2.2	$\hat{P}_2 = \hat{D}_2 + \hat{D}_3$ (∠ at centre = 2 ∠s at circumf.) ✓ S/R $\hat{P}_2 + \hat{P}_3 = \hat{D}_2 + \hat{D}_3$ (∠s in same circle segment) ✓ S/R ∴ $\hat{P}_2 = \hat{P}_3$ ✓ S PB bisects $Q\hat{P}A$ and QB bisects $P\hat{A}Q$ ✓ S ∴ B is the incentre of Δ PQA (4)	
9.2.3	$\hat{A}_1 = \hat{A}_2$ (B is incentre) ✓ S/R $\hat{A}_1 = \hat{Q}_1$ (∠s in same segment) ✓ S/R ∴ $\hat{A}_2 = \hat{Q}_1$ ✓ S ∴DQ is a tang. to the circle ACQ ∴ (∠ between line and chord = ∠ subtended by chord) ✓ R (4)	
9.2.4	$\hat{D}_2 + \hat{D}_3 = 90°$ ✓ S (∠ in semi-circle) ✓ R ∴ $AQ^2 = AD^2 + DQ^2$ ✓ S (Pyth.) and $\hat{R}_1 = 90°$ ✓ S (line from centre to midpt of chord) ✓ R and ADR ||| ΔADQ (perp. from rt ∠ to hyp) ✓ R $\therefore AD^2 = AR . AQ$ ✓ S $\therefore AQ^2 = AR.AQ + DQ^2$ (7)	**TOTAL: 200**