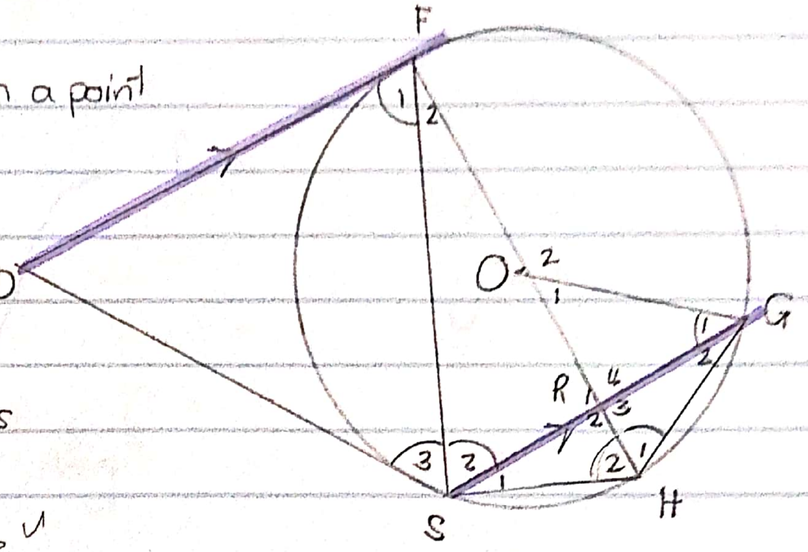
MAFTOBI EXAM 2021 V1



1a. $DF = DS$ tangents from a point

$\therefore \hat{F}_1 = \hat{S}_3$ $\angle$s opp = sides

$\hat{F}_1 = \hat{S}_2$ alt $\angle$s, $DF \parallel SG$

$\hat{S}_2 = \hat{H}_1$ $\angle$s same segm.

$OH = OG$ radii

$\therefore \hat{H}_1 = O\hat{G}H$ $\angle$s opp = sides

$\therefore \hat{F}_1 = \hat{S}_3 = \hat{H}_1 = O\hat{G}H$

and $\hat{D} = \hat{O}_1$ 3rd angle

$\therefore \triangle DSF \parallel\!\parallel \triangle OHG$ (4)

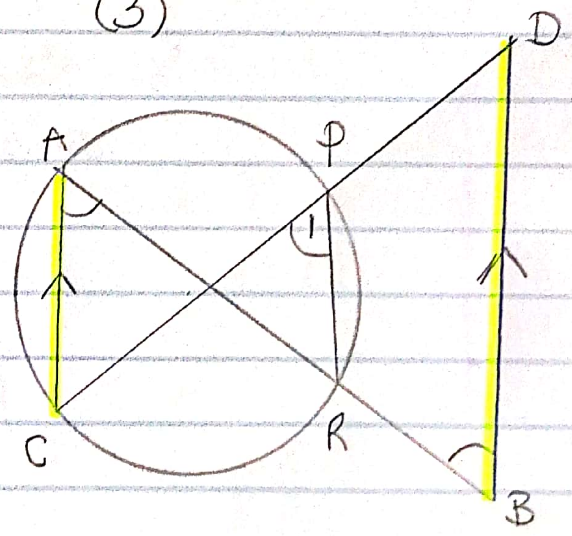
b. $$\frac{DS}{OH} = \frac{SF}{HG} = \frac{DF}{OG}$$

$$\therefore DF = \frac{SF \times OG}{HG}$$

$$= \frac{SF \times OH}{HG}$$

$$= \frac{SF \times \frac{1}{2} FH}{HG}$$

$$\therefore 2DF = \frac{SF \times FH}{HG}$$ (3)



2. $\hat{A} = \hat{P}_1$ $\angle$s in same segment

$\hat{A} = \hat{B}$ alt $\angle$s, $AC \parallel DB$

$\therefore \hat{P}_1 = \hat{B}$

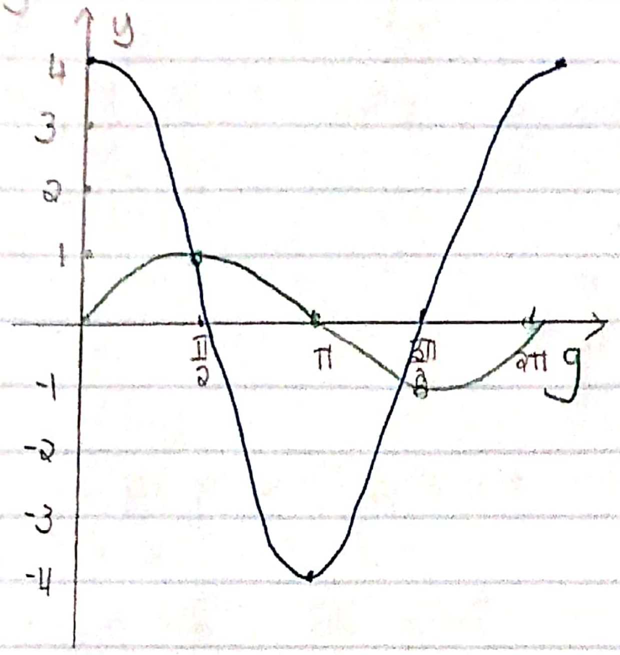
$\therefore PRBD$ is a cyclic quad

(ext $\angle$ = opp int $\angle$)

(3)

3a $f(x) = 4\cos x$

$g(x) = \sin x$



f ✓✓

g ✓✓

(3)

b. $-2f(x) = -8\cos x$

amplitude $= 8$ (1)

c. $\frac{f(x)}{g(x)}$ is undefined for $g(x) = 0$

$\therefore x \in \{0;\ \pi;\ 2\pi\}$ (2)

4a. $A = B$

$\sin 43^\circ = \cos(90^\circ - k)\cos 23^\circ + \cos 246^\circ \sin 23^\circ$

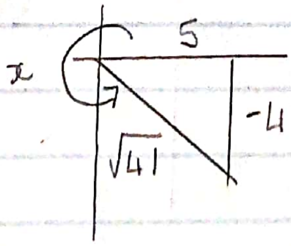
$= \sin k \cos 23^\circ - \cos 66^\circ \sin 23^\circ$ ✓ ✓

$\sin 43^\circ = \sin(66^\circ - 23^\circ)$ ✓

$\therefore k = 66^\circ$ ✓ (4)

b. $5\tan x + 4 = 0 \qquad x \in [\pi;\ 2\pi]$

i $\tan x = \frac{-4}{5}$



(1)

$r^2 = 25 + 16$

ii $2\cos(\pi - x) = -2\cos x$ ✓

$= \dfrac{-10}{\sqrt{41}}$ ✓ (2)

iii $\sin^2\left(x - \frac{\pi}{2}\right) - \sin^2 x = \cos^2 x - \sin^2 x$ ✓

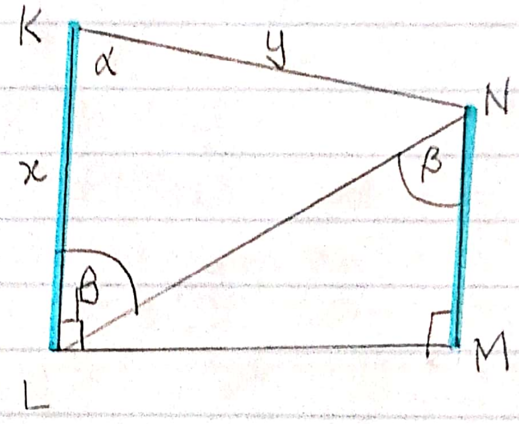
$= \dfrac{25 - 16}{41}$ ✓

$= \dfrac{9}{41}$ ✓ (2)

5. Since $K\hat{L}M = L\hat{M}N = 90°$,

$KL \parallel NM$ ✓

$\therefore L\hat{N}M = \beta$ alt. ∠s ✓



$\dfrac{NM}{NL} = \cos\beta$

$\therefore NM = NL\cos\beta$ ① ✓

In ΔKLN:

$\dfrac{NL}{\sin\alpha} = \dfrac{x}{\sin[180° - (\alpha+\beta)]}$ ✓

$\therefore NL = \dfrac{x\sin\alpha}{\sin(\alpha+\beta)}$ ② ✓

② into ①: $NM = \dfrac{x\sin\alpha\cos\beta}{\sin(\alpha+\beta)}$ ✓ (3)

(b) Area $= \frac{1}{2}xy\sin\alpha$ (2)