UDAAN

2026

Trigonometry

MATHS | LECTURE-7

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Topics *to be covered*

A • Trigonometric Identities (Part - 03)

(1) $a^3+b^3=(a+b)(a^2+b^2-ab)$

(2) $a^3-b^3=(a-b)(a^2+b^2+ab)$

For eg,

$$\sin^3\theta-\cos^3\theta=(\sin\theta-\cos\theta)(\underbrace{\sin^2\theta+\cos^2\theta}_{\to 1}+\sin\theta\cos\theta)$$

#Q. Prove the following identity :

$$\frac{(1+\cot A+\tan A)(\sin A-\cos A)}{\sec^3 A-\operatorname{cosec}^3 A}=\sin^2 A\cos^2 A$$

L.H.S

$$= \frac{\left(\frac{1}{1}+\frac{c}{s}+\frac{s}{c}\right)\left(\frac{s-c}{1}\right)}{\frac{1}{c^3}-\frac{1}{s^3}}$$

$$= \frac{\left(\frac{sc+c^2+s^2}{sc}\right)\left(\frac{s-c}{1}\right)}{\frac{s^3-c^3}{c^3s^3}}$$

$$= \frac{\left(\frac{sc+1}{sc}\right)\left(\frac{s-c}{1}\right)}{\frac{(s-c)(s^2+c^2+sc)}{c^3s^3}}$$

$$= \frac{\cancel{(sc+1)}\cancel{(s-c)}(c^{\cancel{3}}s^{\cancel{3}})}{(\cancel{sc})\cancel{(s-c)}\cancel{(1+sc)}} = \boxed{c^2s^2} = \text{R.H.S}$$

H.P//

#Q. Prove the following identity :

$$\frac{\sin^3\theta + \cos^3\theta}{\sin\theta + \cos\theta} + \sin\theta\cos\theta = 1$$

L.H.S

$$= \frac{\cancel{(s+c)}(s^2+c^2-sc)}{\cancel{(s+c)}} + sc$$

$$= 1 \cancel{-sc} \cancel{+sc}$$

$$= \boxed{1}$$

#Q. Prove the following identity :

$$\frac{\cos A}{1-\tan A}+\frac{\sin A}{1-\cot A}=\cos A+\sin A$$

L.H.S

$$=\frac{\frac{c}{1}}{\frac{1}{1}-\frac{s}{c}}+\frac{\frac{s}{1}}{1-\frac{c}{s}}$$

$$=\frac{\frac{c}{1}}{\frac{c-s}{c}}+\frac{\frac{s}{1}}{\frac{s-c}{s}}$$

$$=\frac{c^2}{c-s}+\frac{s^2}{s-c}$$

$$=\frac{c^2}{c-s}-\frac{s^2}{c-s}$$

$$=\frac{c^2-s^2}{c-s}$$

$$=\frac{\cancel{(c-s)}(c+s)}{\cancel{(c-s)}}$$

$$=\boxed{c+s}$$

#Q. Prove the following identity :

$$\frac{\cos A}{1-\tan A}+\frac{\sin^2 A}{\sin A-\cos A}=\sin A+\cos A$$

L.H.S

$$=\frac{\frac{c}{1}}{1-\frac{s}{c}}+\frac{\frac{s^2}{1}}{\frac{s-c}{1}}$$

$$=\frac{\frac{c}{1}}{\frac{c-s}{c}}+\frac{\frac{s^2}{1}}{\frac{s-c}{1}}$$

$$=\frac{c^2}{c-s}+\frac{s^2}{s-c}$$

$$=\frac{c^2}{c-s}-\frac{s^2}{c-s}$$

$$=\frac{c^2-s^2}{c-s}=\frac{\cancel{(c-s)}(c+s)}{\cancel{c-s}}=\boxed{c+s}$$

#Q. Prove the following identity :

$$\frac{\cos^2\theta}{1-\tan\theta}+\frac{\sin^3\theta}{\sin\theta-\cos\theta}=1+\sin\theta\cos\theta$$

L.H.S

$$=\frac{c^2}{1-\frac{s}{c}}+\frac{s^3}{s-c}$$

$$=\frac{c^2}{\frac{c-s}{c}}+\frac{s^3}{s-c}$$

$$=\frac{c^3}{c-s}+\frac{s^3}{s-c}$$

$$=\frac{c^3}{c-s}-\frac{s^3}{c-s}$$

$$=\frac{c^3-s^3}{c-s}$$

$$=\frac{\cancel{(c-s)}(c^2+s^2+cs)}{\cancel{(c-s)}}$$

$$=\boxed{1+sc}$$

#Q. Prove the following identity :

$$\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}=1+\tan A+\cot A=1+\sec A\,\operatorname{cosec}A$$

L.H.S

$$=\frac{\frac{t}{1}}{1-\frac{1}{t}}+\frac{c}{1-t}$$

$$=\frac{\frac{t}{1}}{\frac{t-1}{t}}+\frac{c}{1-t}$$

$$=\frac{t^2}{t-1}+\frac{c}{1-t}$$

$$=\frac{t^2}{t-1}-\frac{c}{t-1}$$

$$=\frac{t^2-c}{t-1}$$

$$=\frac{\frac{t^2}{1}-\frac{1}{t}}{\frac{t-1}{1}}$$

$$=\frac{\frac{t^3-1}{t}}{\frac{t-1}{1}}$$

$$= \frac{t^3 - 1^3}{t(t-1)}$$

$$= \frac{\cancel{(t-1)}(t^2 + 1^2 + t)}{t\cancel{(t-1)}}$$

$$= \frac{t^2 + 1 + t}{t}$$

$$= \frac{t^{\cancel{2}}}{\cancel{t}} + \frac{1}{t} + \frac{\cancel{t}}{\cancel{t}}$$

$$= \boxed{\tan A + \cot A + 1}$$

$$= \frac{\sin A}{\cos A} + \frac{\cos A}{\sin A} + 1$$

$$= \frac{\sin^2 A + \cos^2 A}{\cos A \sin A} + 1$$

$$= \frac{1 \times 1}{\cos A \sin A} + 1$$

$$= \boxed{\sec A \operatorname{cosec} A + 1}$$

#Q. Prove the following identity :

#GPK

$$\frac{\tan A}{1-\cot A}+\frac{\cot A}{1-\tan A}=1+\tan A+\cot A=1+\sec A\operatorname{cosec} A$$

SinAcosA

#Q. Prove the following identity : $\tan^2\theta + \cot^2\theta + 2 = \sec^2\theta \operatorname{cosec}^2\theta$

M.I

$$= \frac{s^2}{c^2} + \frac{c^2}{s^2} + \frac{2}{1}$$

$$= \frac{s^4 + c^4 + 2s^2c^2}{c^2 s^2}$$

$$= \frac{(s^2)^2 + (c^2)^2 + 2s^2c^2}{c^2s^2}$$

$$= \frac{(s^2+c^2)^2}{c^2s^2} = \frac{1}{c^2s^2} = \boxed{\sec^2 A \operatorname{cosec}^2 A}$$

M.II

$$\sec^2\theta - 1 + \operatorname{cosec}^2\theta - 1 + 2$$

$$\sec^2\theta + \operatorname{cosec}^2\theta \cancel{-2} \cancel{+2}$$

$$\sec^2\theta + \operatorname{cosec}^2\theta$$

$$= \frac{1}{c^2} + \frac{1}{s^2}$$

$$= \frac{s^2 + c^2}{c^2s^2}$$

$$= \frac{1}{c^2s^2}$$

M.III

$$\boxed{\tan^2\theta + \cot^2\theta + 2\tan\theta\cot\theta}$$

$$= (\tan\theta + \cot\theta)^2$$

$$= \left(\frac{s}{c} + \frac{c}{s}\right)^2$$

$$= \left(\frac{s^2+c^2}{cs}\right)^2$$

$$= \left(\frac{1}{cs}\right)^2 = \frac{1}{c^2s^2}$$

#Q. $\frac{1+\tan^2 A}{1+\cot^2 A}$ is equal to:

$$= \frac{\sec^2 A}{\operatorname{cosec}^2 A}$$

A $\sec^2 A$

B -1

$$= \frac{\frac{1}{\cos^2 A}}{\frac{1}{\sin^2 A}}$$

C $\cot^2 A$

D $\tan^2 A$

$$= \frac{\sin^2 A}{\cos^2 A} = \tan^2 A$$

#Q. The value of $\frac{\sin\theta\tan\theta}{1-\cos\theta}+\tan^2\theta-\sec^2\theta$ is

A) $\sin\theta\cos\theta$

B) $\sec\theta$

C) $\tan\theta$

D) $\operatorname{cosec}\theta$

$\sec^2\theta = 1+\tan^2\theta$

$\boxed{-1 = \tan^2\theta - \sec^2\theta}$

$$= \frac{s\left(\frac{s}{c}\right)}{\frac{1-c}{1}} - 1$$

$$= \frac{\frac{s^2}{c}}{\frac{1-c}{1}} - 1$$

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

$$= \frac{s^2}{c-c^2} - \frac{1}{1}$$

$$= \frac{s^2-c+c^2}{c-c^2}$$

$$= \frac{1-c}{c-c^2}$$

$$= \frac{\cancel{1-c}}{c(\cancel{1-c})}$$

$$= \frac{1}{c} = \sec\theta$$

Concept

$$a^2-b^2=(a+b)(a-b)$$

$$a^4-b^4$$

$$(a^2)^2-(b^2)^2=(a^2+b^2)(a^2-b^2)$$

eg.

$$\sin^4\theta-\cos^4\theta=(\sin^2\theta)^2-(\cos^2\theta)^2$$

$$=(\sin^2\theta+\cos^2\theta)(\sin^2\theta-\cos^2\theta)$$

$$1$$

$$\boxed{a^2+b^2=(a+b)^2-2ab}$$

Concept

eg, $\sin^4\theta+\cos^4\theta$

$$=(\sin^2\theta)^2+(\cos^2\theta)^2$$

$$=(\sin^2\theta+\cos^2\theta)^2-2\sin^2\theta\cos^2\theta$$

$$=\boxed{1-2\sin^2\theta\cos^2\theta}$$

#Q. Prove that : $\frac{(\sin^4\theta+\cos^4\theta)}{1-2\sin^2\theta\cos^2\theta}=1$

L.H.S

$$= \frac{(\sin^2\theta)^2+(\cos^2\theta)^2}{1-2\sin^2\theta\cos^2\theta}$$

$$= \frac{(\sin^2\theta+\cos^2\theta)^2-2\sin^2\theta\cos^2\theta}{1-2\sin^2\theta\cos^2\theta}$$

$$= \frac{\cancel{1-2\sin^2\theta\cos^2\theta}}{\cancel{1-2\sin^2\theta\cos^2\theta}} = \boxed{1}$$

#Q. $\cos^4 x - \sin^4 x =$

$= (c^2)^2 - (s^2)^2$

$= (c^2+s^2)(c^2-s^2)$

$= c^2 - s^2$

A) $2\sin^2 x - 1$

B) $-1 + 2\cos^2 x$

C) $\sin^2 x - \cos^2 x$

D) 1

$= 1 - s^2 - s^2$

$= \boxed{1-2s^2}$

$= c^2 - (1-c^2)$

$= c^2 - 1 + c^2$

$= \boxed{2c^2-1}$

#Q. Prove the following identity :

#GPU

$$(\sin^4\theta - \cos^4\theta + 1)\operatorname{cosec}^2\theta = 2$$


Tumhe jo maine
Dekha
Tumhe jo maine
jana
nic
madagascar
chocolate
31.5K

#Q. Prove the following identity :

$$\frac{\tan\theta + \sec\theta - 1}{\boxed{\tan\theta - \sec\theta + 1}} = \frac{1 + \sin\theta}{\cos\theta}$$

D

$$\boxed{\sec^2\theta - \tan^2\theta = 1}$$

L.H.S

$$= \frac{\tan\theta + \sec\theta - (\sec^2\theta - \tan^2\theta)}{D}$$

$$= \frac{(\sec\theta + \tan\theta) - [(\sec\theta + \tan\theta)(\sec\theta - \tan\theta)]}{D}$$

$$= \frac{(\sec\theta + \tan\theta)[1 - (\sec\theta - \tan\theta)]}{D}$$

$$= \frac{(\sec\theta + \tan\theta)\cancel{(1 - \sec\theta + \tan\theta)}}{\cancel{(\tan\theta - \sec\theta + 1)}}$$

$$= \sec\theta + \tan\theta$$

$$= \frac{1}{\cos\theta} + \frac{\sin\theta}{\cos\theta}$$

$$= \boxed{\frac{1 + \sin\theta}{\cos\theta}}$$

#Q. Prove the following identity :

$$\frac{\cot A + \operatorname{cosec} A - 1}{\cot A - \operatorname{cosec} A + 1} = \frac{1 + \cos A}{\sin A}$$

$\operatorname{cosec}^2\theta = 1 + \cot^2\theta$

$\boxed{\operatorname{cosec}^2\theta - \cot^2\theta = 1}$

LHS

$$= \frac{\cot A + \operatorname{cosec} A - [\operatorname{cosec}^2 A - \cot^2 A]}{D}$$

$$= \frac{(\operatorname{cosec} A + \cot A) - [(\operatorname{cosec} A + \cot A)(\operatorname{cosec} A - \cot A)]}{D}$$

$$= \frac{(\operatorname{cosec} A + \cot A)\cancel{[1 - \operatorname{cosec} A + \cot A]}}{\cancel{(\cot A - \operatorname{cosec} A + 1)}}$$

$$= \operatorname{cosec} A + \cot A$$

$$= \frac{1}{\sin A} + \frac{\cos A}{\sin A}$$

$$= \boxed{\frac{1 + \cos A}{\sin A}}$$

#Q. Prove the following identity :

$\sin^2 A + \cos^2 A = 1$

$$\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \frac{1}{\sec\theta - \tan\theta}$$

#GPU

L.H.S divide by $\cos\theta$

$$= \frac{\frac{\sin\theta - \cos\theta + 1}{\cos\theta}}{\frac{\sin\theta + \cos\theta - 1}{\cos\theta}}$$

$$= \boxed{\frac{\tan\theta - 1 + \sec\theta}{\tan\theta + 1 - \sec\theta}}$$

#Q. Prove the following identity :

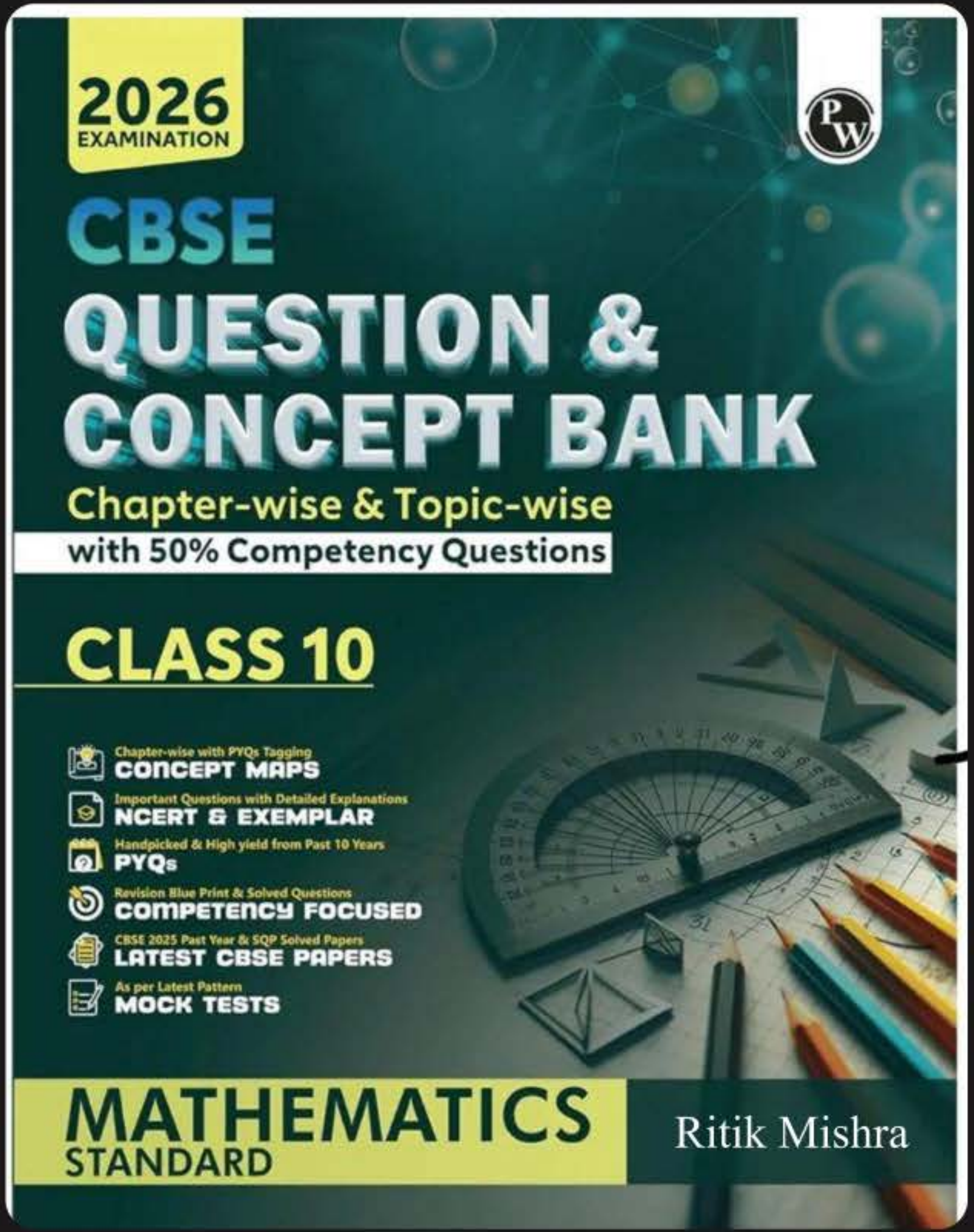
#GPL

$$\frac{\cos A}{1-\sin A}+\frac{\sin A}{1-\cos A}+1=\frac{\sin A\cos A}{(1-\sin A)(1-\cos A)}$$

#Q. Prove the following identity :

#GPH

$$\cot^2 A\left(\frac{\sec A-1}{1+\sin A}\right)+\sec^2 A\left(\frac{\sin A-1}{1+\sec A}\right)=0$$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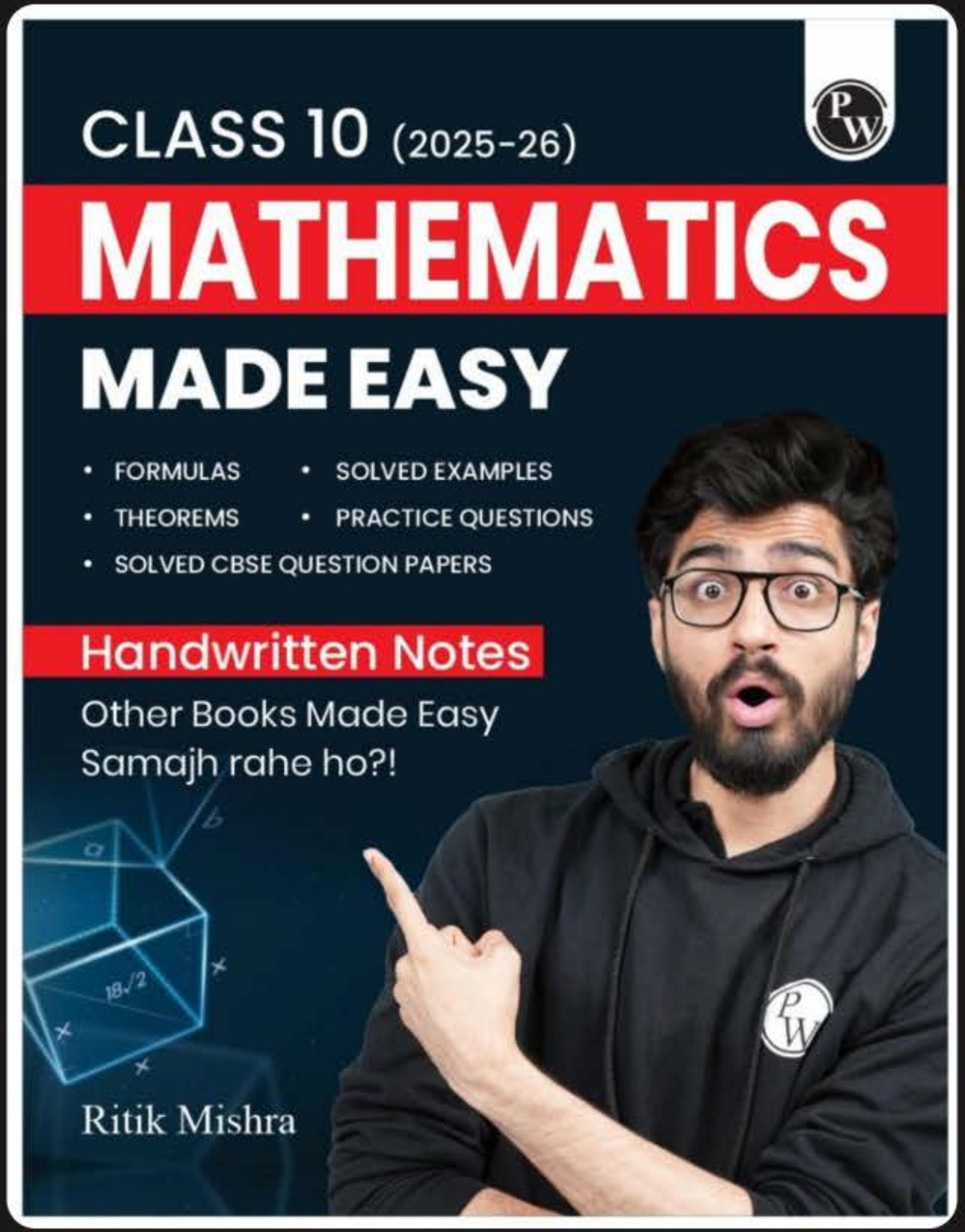

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