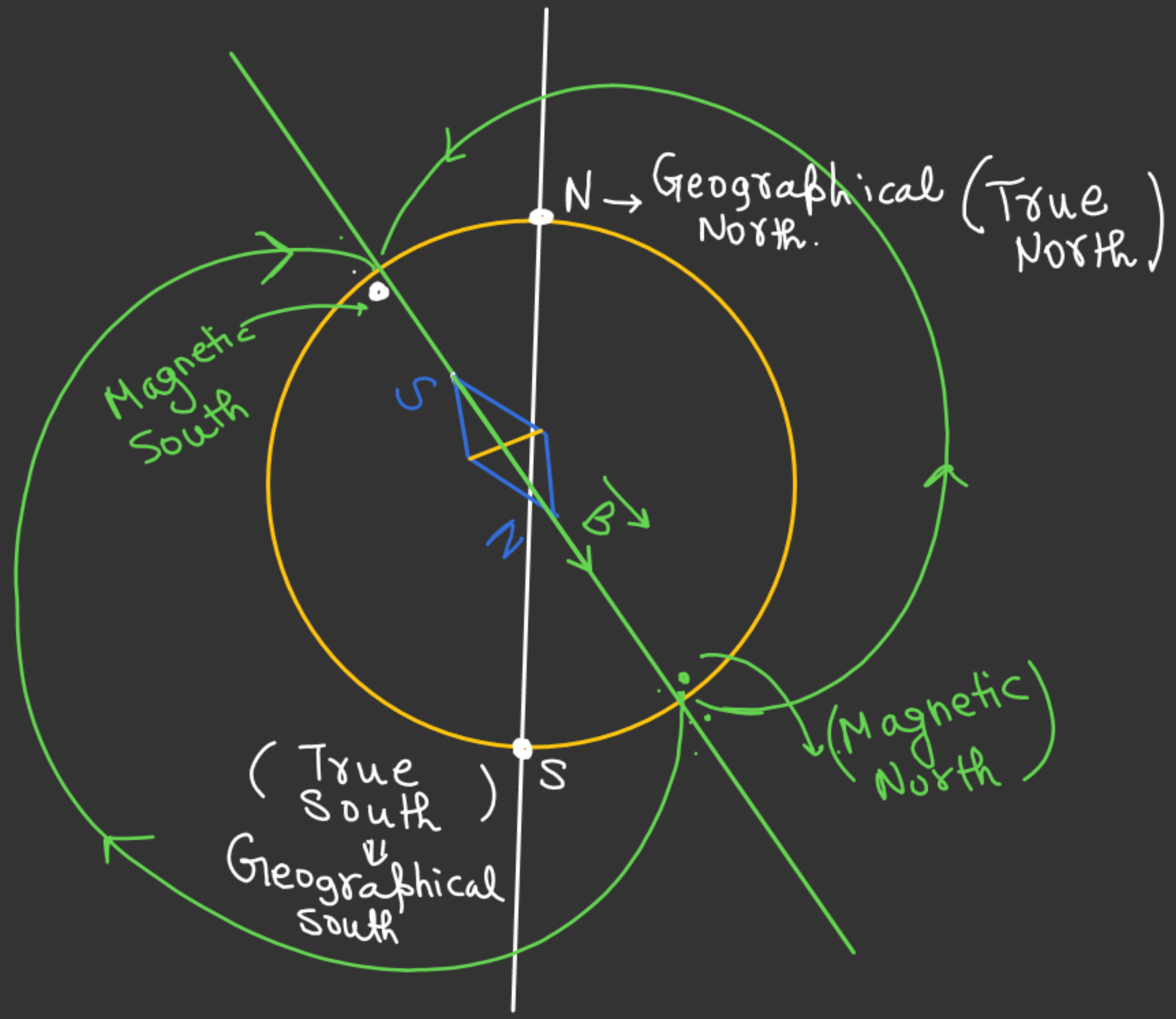
Nishant Jindal

Earth Magnetism :→



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(*) Angle of declination

⇒ [It is the angle b/w the plane Contaning geografphical meridian and Magnetic Meridian.]

θ = [Angle of declination]

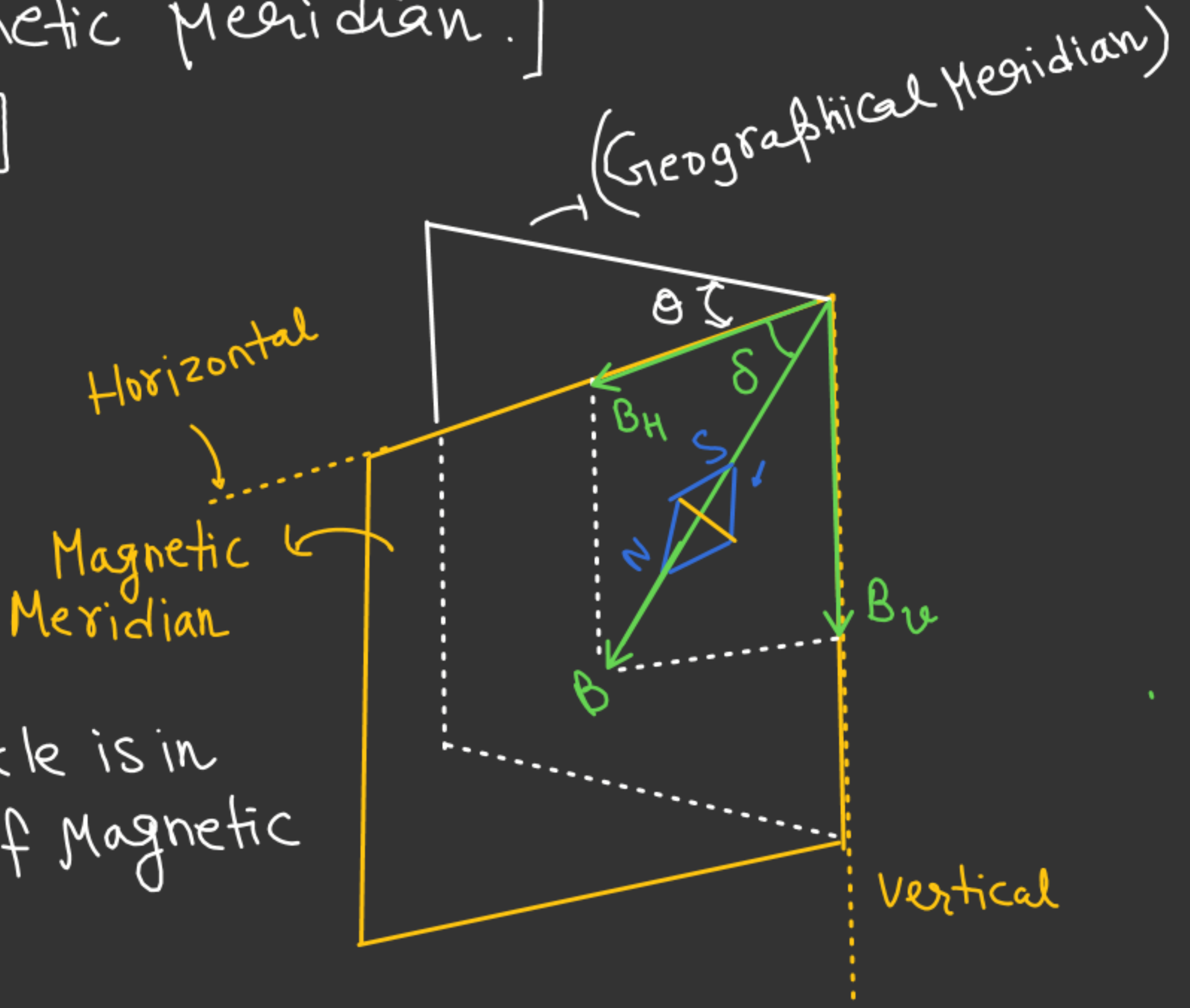
(*) Angle of dip :→

or

[Angle of Inclination]

$$\boxed{\tan\delta = \frac{B_v}{B_H}}$$

True dip ⇒ [When dip Circle is in the plane of Magnetic Meridian



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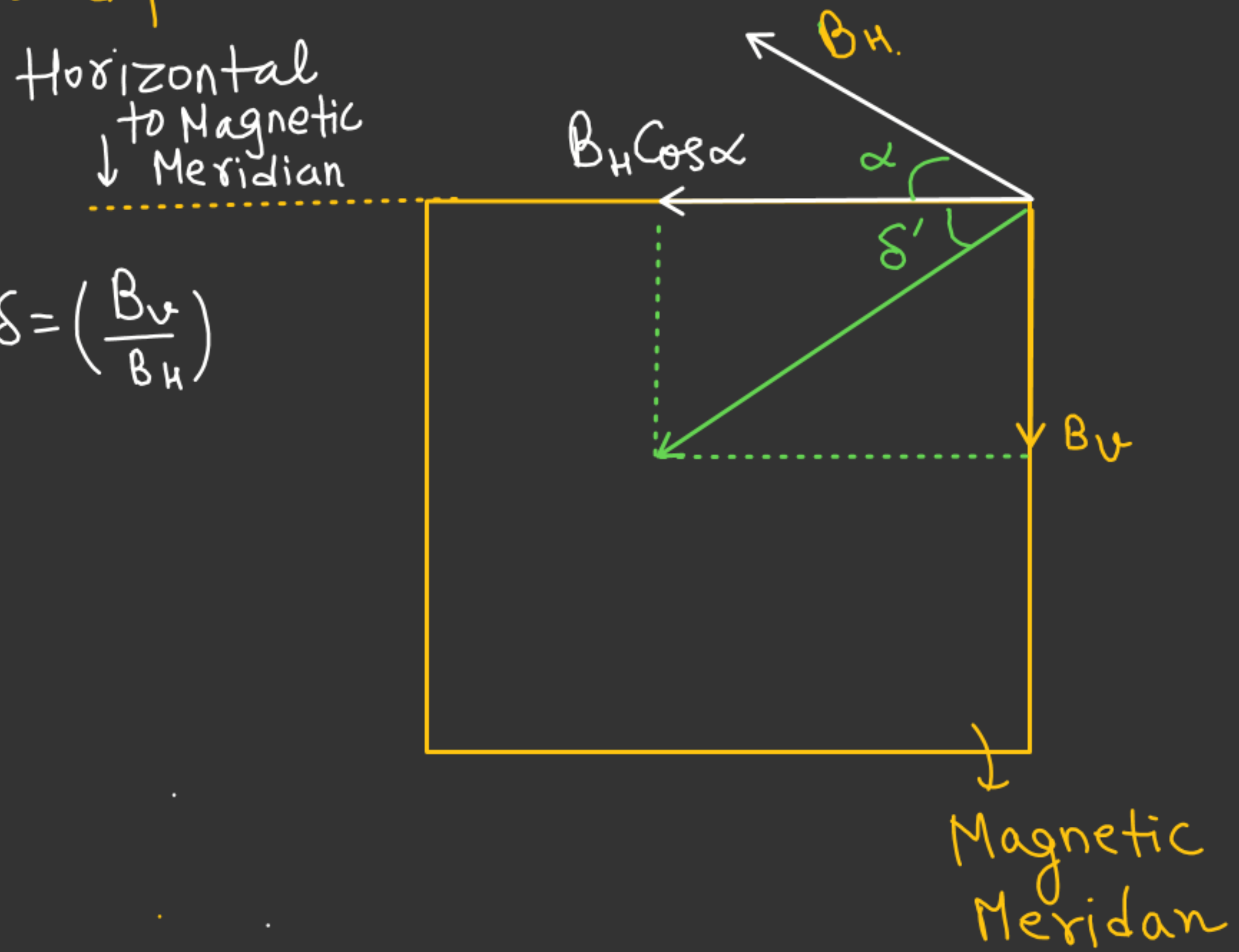
Case :- ⇒ Dip Circle is not in the plane of Magnetic Meridian.
If it make's an angle α with Magnetic Meridian then dip is Called Apparent dip.

$$\tan\delta' = \frac{B_V}{B_H\cos\alpha}$$

** $\tan\delta = \left(\frac{B_V}{B_H}\right)$

$$\boxed{\tan\delta' = \frac{\tan\delta}{\cos\alpha}} \quad \text{—(1)}$$

⇓



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(4). If dip circle is rotated at angle 90° from present position i.e when dip circle make's angle α with horizontal. then B_H makes an angle $(90-\alpha)$ with horizontal.

$$\tan\delta' = \frac{\tan\delta}{\cos\alpha} \quad \text{--- (1)}$$

$$\tan\delta'' = \frac{B_v}{B_H\cos(90-\alpha)}$$

$$\tan\delta'' = \frac{B_v}{B_H\sin\alpha}$$

$$\tan\delta'' = \frac{\tan\delta}{\sin\alpha} \quad \text{--- (2)}$$

From (1) & (2)

$$\cos\alpha = \frac{\tan\delta}{\tan\delta'}, \quad \sin\alpha = \frac{\tan\delta}{\tan\delta''}$$

$$\cos^2\alpha + \sin^2\alpha = \tan^2\delta\left[\frac{1}{\tan^2\delta'} + \frac{1}{\tan^2\delta''}\right]$$

$$\frac{1}{\tan^2\delta} = \frac{1}{\tan^2\delta'} + \frac{1}{\tan^2\delta''}$$

$$\boxed{\cot^2\delta = \cot^2\delta' + \cot^2\delta''}$$

(True dip)

(B_H Make's an angle α with horizontal)

(B_H Make's an angle $90-\alpha$ with horizontal)

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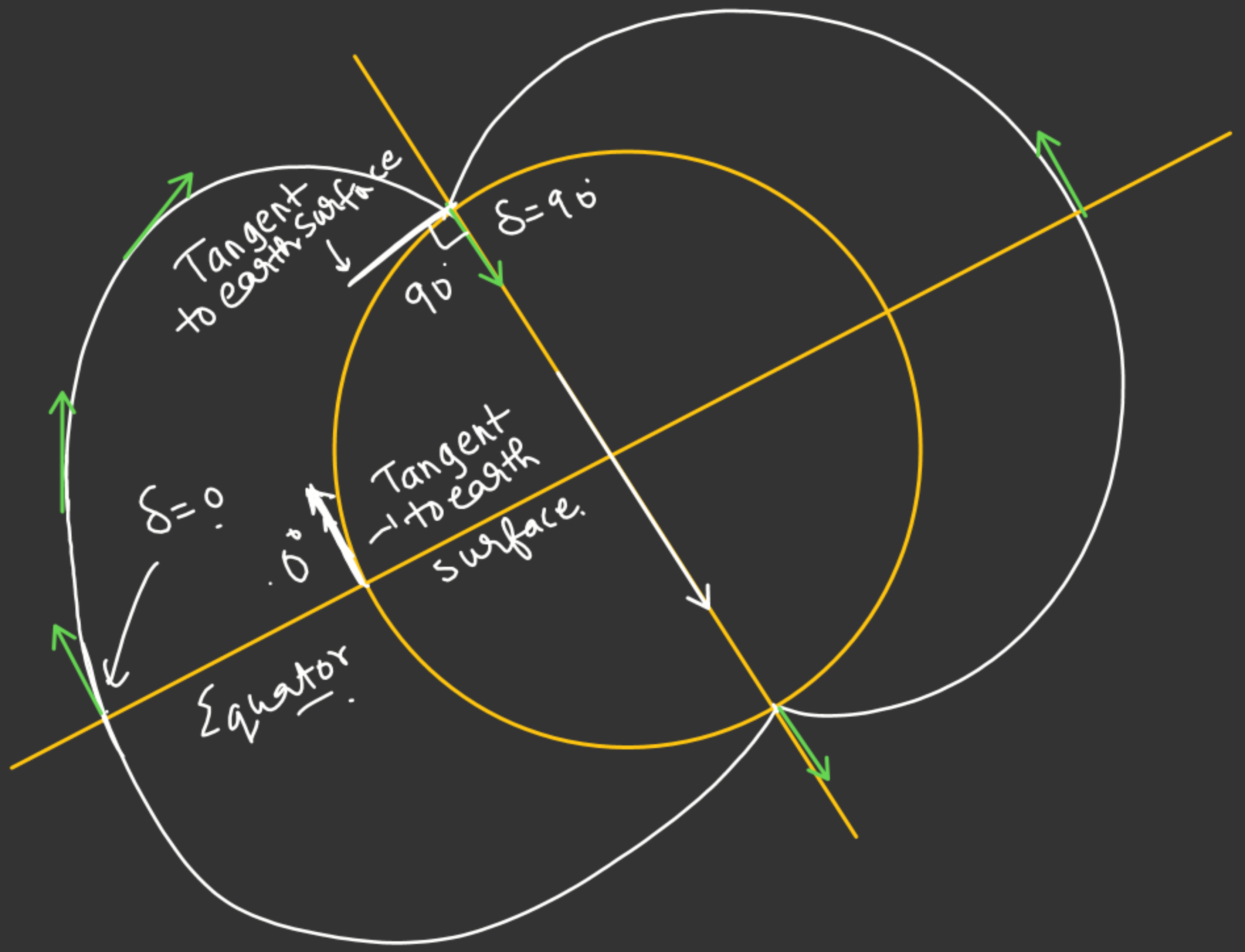


No use

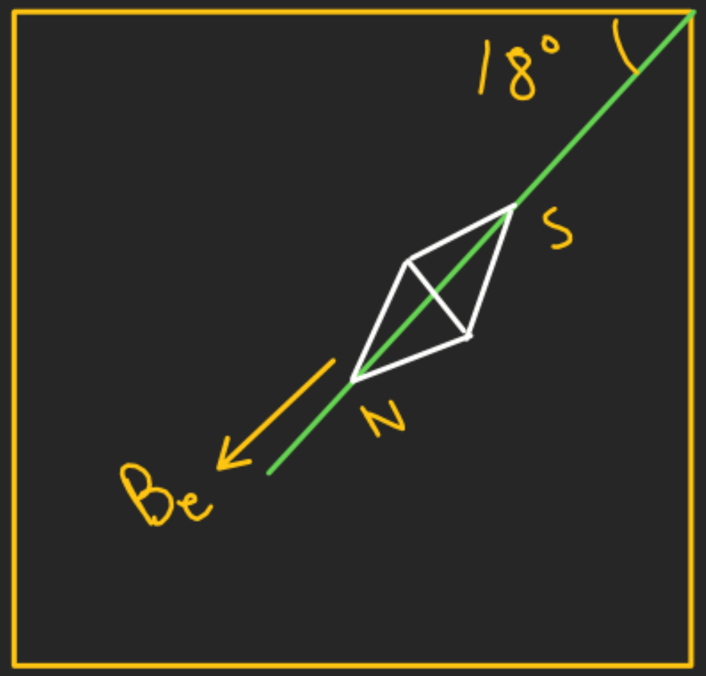
Magnetic needle (compass) points 3.5° west of geographic north. Another needle free to rotate in vertical plane parallel to magnetic meridian has its north tip pointing down at 18° with the horizontal. The magnitude of the horizontal component of the earth's magnetic field at the place is $0.40G.$ → B_H What is the magnitude of earth's magnetic field at that place? (Given, cos $18^\circ = 0.95, \sin 18^\circ = 0.31)$

$$B_e \cos 18^\circ = B_H$$

$$B_e = \frac{B_H}{\cos 18^\circ}$$

$$B_e = \left(\frac{0.40}{0.95}\right)$$

$$B_e = \underline{0.42G}$$



E

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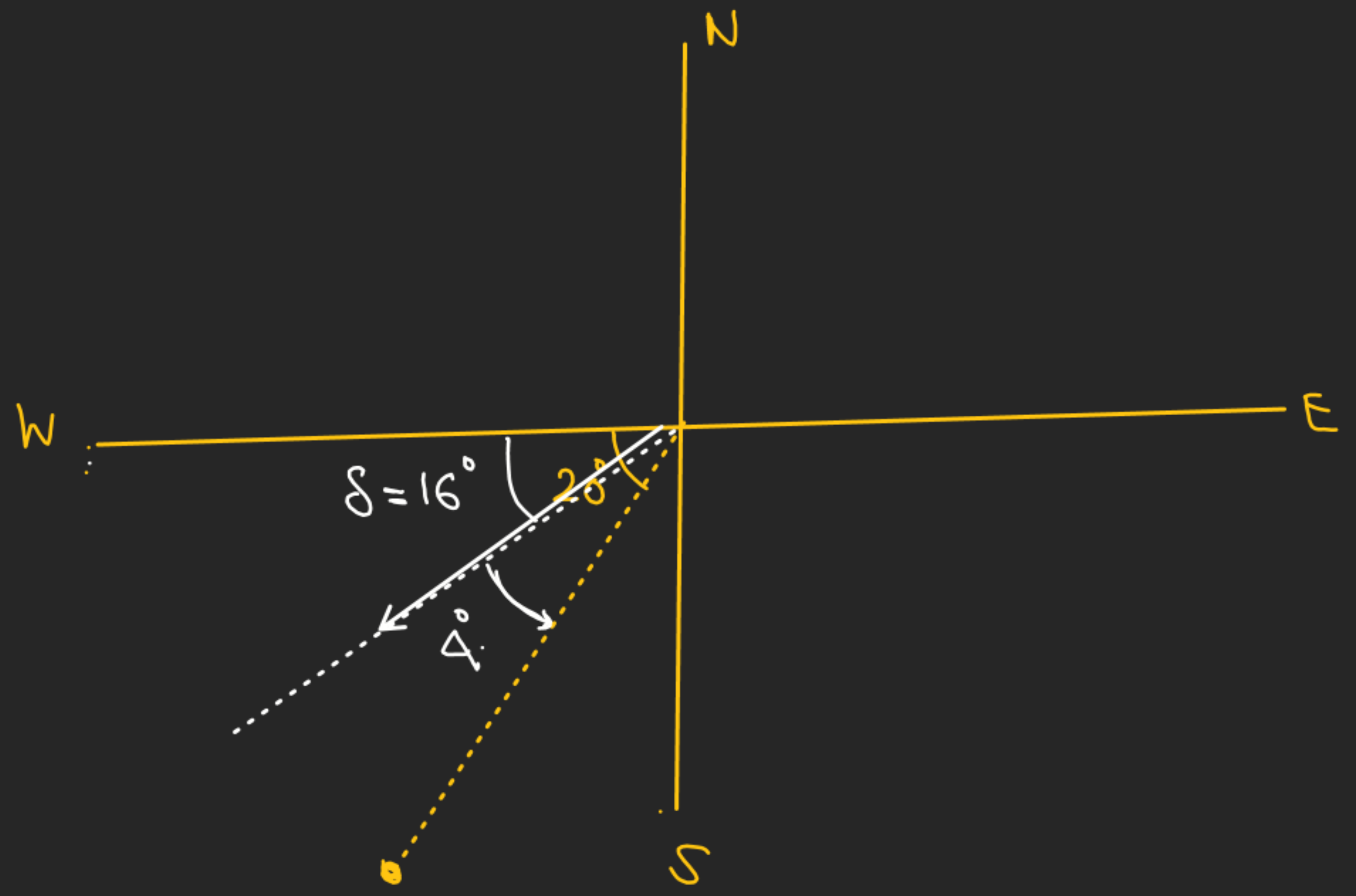
EARTH MAGNETISM

Q.2 A ship is to reach a place 20° south of west. In what direction should it be steered if angle of declination at the place is 16° west?

$\delta = ??$

$4^\circ \rightarrow$ South of west



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EARTH MAGNETISM

Q.3 The true value of dip at a place is 30°. The vertical plane carrying needle is turned through 30° from magnetic meridian. Calculate apparent value of angle of dip.

$\delta = 30^\circ$

$\tan\delta = \dfrac{B_V}{B_H}$

$\tan 30^\circ = \left(\dfrac{B_V}{B_H}\right)$ — (1)

$\tan\delta' = \dfrac{\tan\delta}{\cos\alpha}$

$\tan\delta' = \dfrac{\tan 30^\circ}{\cos 30^\circ}$

$\tan\delta' = \dfrac{1}{\sqrt{3}} \times \dfrac{2}{\sqrt{3}} = \dfrac{2}{3}$

$\delta' = \tan^{-1}\left(\dfrac{2}{3}\right)$

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EARTH MAGNETISM

Q.4 The angles of dip at two places are 30° and 45° respectively. What is the ratio of horizontal components of earth's magnetic field at the two places, if vertical components at the two places are same?

Sol^n :→

$$\tan 30^\circ = \frac{B_V}{B_H}$$

$$\tan 45^\circ = \frac{B_V}{B_H'}$$

$$\frac{\tan 30^\circ}{\tan 45^\circ} = \frac{B_H'}{B_H}$$

$$\left(\frac{B_H'}{B_H} = \frac{1}{\sqrt{3}}\right) ✓$$

EARTH MAGNETISM

Q.5 The values of apparent angles of dip at two places measured in two mutually perpendicular planes are $30°$ and $45°$. Determine the true angle of dip at the place.

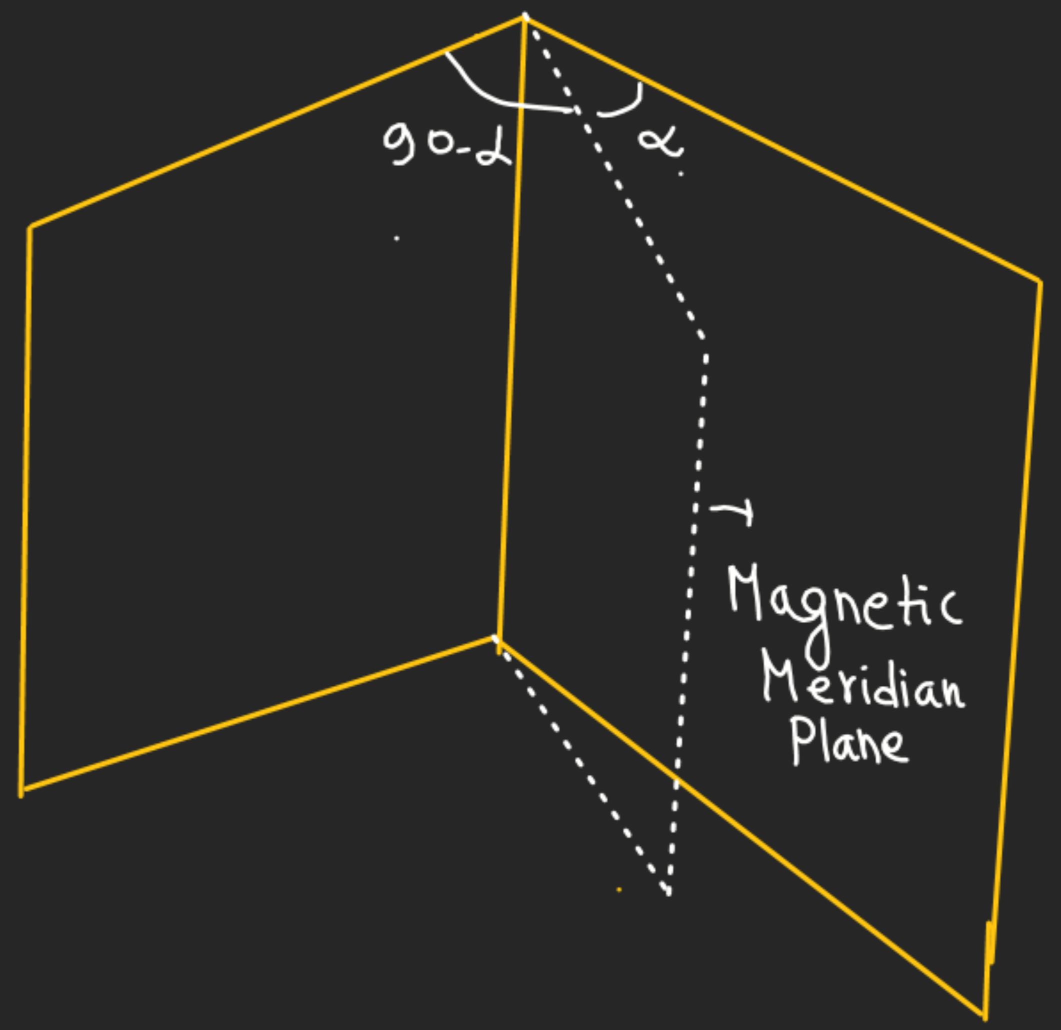
Sol^n.

$$\cot^2\delta = \cot^2\delta' + \cot^2\delta''$$

$\Downarrow$

(True dip)

$$\boxed{\delta = \tan^{-1}\left(\frac{1}{2}\right)}$$



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EARTH MAGNETISM

Magnetic properties.

⇒ H.C.V.

⇒ Board Books

↳ Diamagnetic ✓

↳ Paramagnetic ✓

→ Ferromagnetic

→ Properties

→ Curie's Law ✓

→ Hysteresis Curve. ✓