

## Trigonometric Functions - Class XI

### Related Questions with Solutions

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#### Questions

##### Question: 01

If  $\cos \theta + \cos \phi = \alpha$ ,  $\cos 2\theta + \cos 2\phi = \beta$  and  $\cos 3\theta + \cos 3\phi = \gamma$ , then

- A.  $\cos^2 \theta + \cos^2 \phi = 1 + \frac{\beta}{2}$   
B.  $\cos \theta \cdot \cos \phi = \frac{\alpha^2}{2} - \frac{\beta + 2}{4}$   
C.  $2\alpha^3 + \gamma = 3\alpha(1 + \beta)$   
D.  $\alpha + \beta + \gamma = 3\alpha\beta\gamma$

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#### Solutions

##### Solution: 01

$$(\cos \theta + \cos \phi)^2 = \alpha^2 \dots \dots \dots [i]$$

$$\Rightarrow \cos^2 \theta + \cos^2 \phi + 2 \cos \theta \cos \phi = \alpha^2$$

$$\text{Now, } \cos 2\theta + \cos 2\phi = \beta$$

$$\Rightarrow (2 \cos^2 \theta - 1) + (2 \cos^2 \phi - 1) = \beta$$

$$\Rightarrow 2 (\cos^2 \theta + \cos^2 \phi) = \beta + 2$$

$$\Rightarrow \cos^2 \theta + \cos^2 \phi = \frac{\beta}{2} + 1 \dots \dots \dots [ii]$$

From [i] and [ii], we get

$$\cos \theta \cdot \cos \phi = \frac{\alpha^2}{2} - \frac{\beta + 2}{4}$$

$$\text{Also, } \cos 3\theta + \cos 3\phi = \gamma$$

$$\Rightarrow (4 \cos^3 \theta - 3 \cos \theta) + (4 \cos^3 \phi - 3 \cos \phi) = \gamma$$

$$\Rightarrow 4 (\cos^3 \theta + \cos^3 \phi) - 3(\cos \theta + \cos \phi) = \gamma$$

$$\Rightarrow 4 [(\cos \theta + \cos \phi) (\cos^2 \theta + \cos^2 \phi - \cos \theta \cos \phi)] - 3(\cos \theta + \cos \phi) = \gamma$$

$$\Rightarrow 4\alpha \left[ \left( \frac{\beta + 2}{2} \right) - \frac{1}{2} \left( \alpha^2 - \frac{\beta + 2}{2} \right) \right] - 3\alpha = \gamma$$

$$\therefore 2\alpha^3 + \gamma = 3\alpha(1 + \beta)$$

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#### Correct Options

Answer:01

Correct Options: A, B, C