

Foundation Batch



MATHS

Trigonometry

Part -11

LIVE 14-11-2024 07:00PM





125. Find: $\tan\left(\frac{5\pi}{4} + \theta\right) - \tan\left(\frac{\pi}{4} - \theta\right)$?

ज्ञात कीजिये $\tan\left(\frac{5\pi}{4} + \theta\right) - \tan\left(\frac{\pi}{4} - \theta\right)$?

(a) $2\cot 2\theta$

(b) $2\tan 2\theta$

(c) $2\sec 2\theta$

(d) $2\cos 2\theta$

$$\tan\left(\pi + \left(\frac{\pi}{4} + \theta\right)\right) - \tan\left(\frac{\pi}{4} - \theta\right)$$

$$\tan\left(\frac{\pi}{4} + \theta\right) - \tan\left(\frac{\pi}{4} - \theta\right)$$

$$\sec 2\theta + \tan 2\theta - (\sec 2\theta - \tan 2\theta)$$

$$\cancel{\sec 2\theta} + \tan 2\theta - \cancel{\sec 2\theta} + \tan 2\theta$$

$$\underline{2\tan 2\theta}$$

126. If $A + B + C = \pi$, then the value of $\tan(A + B) + \tan C$ is:

यदि $A + B + C = \pi$, तो $\tan(A + B) + \tan C$ का मान है:

(a) $\sqrt{2}$

(b) -1

(c) 1

(d) 0

$$C = \pi - (A + B)$$

$$\tan C = \tan(\pi - (A + B))$$

$$\tan C = -\tan(A + B)$$

$$\tan C + \tan(A + B) = 0$$

127. If $\tan A + \tan B + \tan C = \tan A \tan B \tan C$, then $(A + B + C)$ will be equal to:

यदि $\tan A + \tan B + \tan C = \tan A \tan B \tan C$, तो $(A+B+C)$ बराबर होगा:

(a) 0

(b) $\frac{\pi}{2}$

☒ (c) π

(d) 2π

$$A + B + C = 180^\circ$$

$$A + B = 180 - C$$

$$\tan(A + B) = \tan(180 - C)$$

$$\frac{\tan A + \tan B}{1 - \tan A \tan B} = \tan C$$

$$\tan A + \tan B =$$

$$-\tan C + \tan A \tan B \tan C$$

$$\tan A + \tan B + \tan C = \tan A \tan B \tan C$$

$$\boxed{A = B + C}$$

$$\tan A = \tan(B + C)$$

↓

$$\tan A = \frac{\tan B + \tan C}{1 - \tan B \tan C}$$

$$\tan A - \underbrace{\tan A \tan B \tan C} = \tan B + \tan C$$

$$\boxed{\tan A - \tan B - \tan C = \tan A \tan B \tan C}$$

$$\tan 80^\circ - \tan 70^\circ - \tan 10^\circ = ?$$

$$= \tan 80^\circ \tan 70^\circ \tan 10^\circ$$



129. $\tan 13x - \tan 9x - \tan 4x = ?$

a. $\cot 13x \cdot \cot 9x \cdot \cot 4x$

~~b.~~ $\tan 13x \cdot \tan 9x \cdot \tan 4x$

c. $1 + \tan 4x \cdot \tan 9x$

d. None

130. If $\tan A - \tan B - \tan C = \tan A \tan B \tan C$, what is the value of A in terms of B and C ?

यदि $\tan A - \tan B - \tan C = \tan A \tan B \tan C$ है, तो B और C के संदर्भ में A का मान क्या है?

A. $A = B + C$

B. $A = 2B - 2C$

C. $A = B - C$

D. $A = \frac{B-C}{2}$

$A = B + C$

#

$$\begin{aligned}a \sin x + b \cos x &= m \\ a \cos x - b \sin x &= n\end{aligned}$$

$$(a^2 + b^2) \underbrace{(\sin^2 x + \cos^2 x)}_{\textcircled{1}} = m^2 + n^2$$

$$a^2 + b^2 = m^2 + n^2$$



$$a \sec x - b \tan x = m$$

$$a \tan x - b \sec x = n$$

$$a^2 - b^2 = m^2 - n^2$$

$$a \operatorname{cosec} x - b \cot x = m$$

$$a \cot x - b \operatorname{cosec} x = n$$

$$a^2 - b^2 = m^2 - n^2$$



(i) $a \sin x + b \cos x = m$

$a \cos x - b \sin x = n$

then,

$$a^2 + b^2 = m^2 + n^2$$

(ii) $a \sec x - b \tan x = m$

$a \tan x - b \sec x = n$

then, $a^2 - b^2 = m^2 - n^2$

(iii) $a \operatorname{cosec} x - b \cot x = m$

$a \cot x - b \operatorname{cosec} x = n$

then, $a^2 - b^2 = m^2 - n^2$

131. If $x = a \cos \theta + b \sin \theta$ and $y = a \sin \theta - b \cos \theta$, then the value of $x^2 + y^2$ is :

यदि $x = a \cos \theta + b \sin \theta$ तथा $y = a \sin \theta - b \cos \theta$ है, तो $x^2 + y^2$ का मान ज्ञात करें।

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

(b) $a - b$

(c) $a^2 + b^2$

(d) $a + b$

$$a^2 + b^2 = x^2 + y^2$$

(SSC CPO 15/03/2019)

$$\sec A = y$$

$$(-n) \tan A = x$$

$$(-n) \sec A = y$$

$$x^2 = x^2 - y^2$$

$$x^2 = x^2 - y^2$$

If $x = m \sec A + n \tan A$ and $y = m \tan A + n \sec A$
what is $x^2 - y^2$ equal to.

- ~~(a) $m^2 - n^2$~~
- (b) $m^2 + n^2$
- (c) $m^2 - n^2 - mn$
- (d) $m^2 - n^2 + mn$

(UPSC CDS 14/09/2020)

133. If $a \cot \theta + b \operatorname{cosec} \theta = p$ and $b \cot \theta + a \operatorname{cosec} \theta = q$ then $p^2 - q^2$ is equal to :

यदि $a \cot \theta + b \operatorname{cosec} \theta = p$ और $b \cot \theta + a \operatorname{cosec} \theta = q$ है, तो $p^2 - q^2$ निम्नलिखित में से किसके बराबर होगा?

~~(a) $b^2 - a^2$~~

(b) 1

~~(c) $a^2 - b^2$~~

(d) $a^2 + b^2$

$$b \operatorname{cosec} \theta + a \cot \theta = p$$

$$b \cot \theta + a \operatorname{cosec} \theta = q$$

$$b \operatorname{cosec} \theta - (-a) \cot \theta = p$$

$$b \cot \theta - (-a) \operatorname{cosec} \theta = q$$

(SSC CGL Mains 17/07/2020)

$$b^2 - a^2 = p^2 - q^2$$



134. If $a \sin A + b \cos A = C$, then $a \cos A - b \sin A$ is equal to :

यदि $a \sin A + b \cos A = C$ है, तो $a \cos A - b \sin A$ इसके बराबर है

(a) $\sqrt{a^2 - b^2 - c^2}$

(b) $\sqrt{a^2 + b^2 - c^2}$

(c) $\sqrt{a^2 + b^2 + c^2}$

(d) $\sqrt{a^2 - b^2 + c^2}$

(SSC CHSL 18/03/2020)

135. If $3\sin \theta + 5\cos \theta = 5$, then what is the value of $5\sin \theta - 3\cos \theta$?

यदि $3\sin \theta + 5\cos \theta = 5$, तो $5\sin \theta - 3\cos \theta$ का मान क्या है?

$$3\cos \theta - 5\sin \theta = x$$

$$= (3\cos \theta - \sin \theta)$$

a. -3

b. -2

c. 5

d. 8

$$3^2 + 5^2 = 5^2 + x^2$$

$$x = \pm 3$$

$$-3$$

(CDS-1 2024)

136. If $\sin x + \cos x = \sqrt{2}\sin x$, then the value of $\sin x - \cos x$

यदि $\sin x + \cos x = \sqrt{2}\sin x$ है, तो $\sin x - \cos x$ का मान ज्ञात करें।

(a) $\sqrt{2}\cos x$ | $\sin x + \cos x = \sqrt{2}\sin x$

(b) $-\sqrt{2}\cos x$ | $\cos x - \sin x = n$

(c) $\sqrt{2}\sin x$ | $1^2 + 1^2 = (\sqrt{2}\sin x)^2 + n^2$

(d) $2\sin x$

$-(\cos x - \sin x)$

$-(\sqrt{2}\cos x)$

$-\sqrt{2}\cos x$

$2 - 2\sin^2 x = n^2$

(SSC CPO 28/06/2024)

$2(1 - \sin^2 x) = n^2$

$2\cos^2 x = n^2 \Rightarrow n = \sqrt{2}\cos x$

137. If $\cos x + \sin x = \sqrt{2}\cos x$, what will be the value of $(\cos x - \sin x)^2 + (\cos x + \sin x)^2$?

यदि $\cos x + \sin x = \sqrt{2}\cos x$ है, तो $(\cos x - \sin x)^2 + (\cos x + \sin x)^2$ का मान क्या होगा?

(a) 2

(b) 1

(c) 0

(d) $\frac{1}{\sqrt{2}}$

$$\sin x - \cos x = n$$

$$1^2 + 1^2 = (\sqrt{2}\cos x)^2 + n^2$$

$$2 - 2\cos^2 x = n^2$$

$$2(1 - \cos^2 x)$$

$$2\sin^2 x = n^2$$

$$n = \sqrt{2}\sin x$$

$$(\sqrt{2}\sin x)^2 + (\sqrt{2}\cos x)^2$$

$$2\sin^2 x + 2\cos^2 x$$

$$2(\sin^2 x + \cos^2 x)$$

$$2 \times 1 = 2$$

(SSC CGL Pre. 19/07/2023)

138. If $\sin \theta + \cos \theta = \frac{\sqrt{11}}{3}$. Find the value of $(\cos \theta - \sin \theta)$.

यदि $\sin \theta + \cos \theta = \frac{\sqrt{11}}{3}$ है, तो $(\cos \theta - \sin \theta)$ का मान ज्ञात कीजिए।

- (a) $\frac{5}{3}$ $\cos \theta - \sin \theta = x$
(b) $\frac{\sqrt{5}}{3}$ $1^2 + 1^2 = \left(\frac{\sqrt{11}}{3}\right)^2 + x^2$
(c) $\frac{\sqrt{7}}{3}$ $2 = \frac{11}{9} + x^2$
(d) $\frac{7}{3}$

(SSC CPO 06/10/2023)

$$x^2 = 2 - \frac{11}{9} = \frac{7}{9}$$

$$x = \sqrt{\frac{7}{9}} = \frac{\sqrt{7}}{3}$$



139. If $\sin \theta + \cos \theta = \frac{1}{29}$, find the value of $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$.

यदि $\sin \theta + \cos \theta = \frac{1}{29}$ है, तो $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$ का मान ज्ञात कीजिए।

(a) $-\frac{1}{41}$ $\cos \theta - \sin \theta = x$

(b) $\frac{1}{43}$ $1^2 + 1^2 = \left(\frac{1}{29}\right)^2 + x^2$

(c) $\frac{41}{29}$ $2 - \frac{1}{841} = x^2$

(d) $\frac{43}{29}$ $\frac{1682-1}{841} = x^2$

$$\sin \theta - \cos \theta = -\frac{41}{29}$$

$$\frac{\frac{1}{29}}{-\frac{41}{29}} = -\frac{1}{41}$$

(SSC CHSL 03/08/2023)

$$x^2 = \frac{1681}{841} \Rightarrow x = \sqrt{\frac{1681}{841}} = \frac{41}{29} = \cos \theta - \sin \theta$$



139. If $\sin \theta + \cos \theta = \frac{1}{29}$, find the value of $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$.

यदि $\sin \theta + \cos \theta = \frac{1}{29}$ है, तो $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$ का मान ज्ञात कीजिए।

(a) $\frac{1}{41}$ $\cos \theta + \sin \theta = \frac{1}{29}$

(b) $\frac{1}{43}$ $\sin \theta - \cos \theta = n$

(c) $\frac{41}{29}$ $1^2 + 1^2 = \left(\frac{1}{29}\right)^2 + n^2$

(d) $\frac{43}{29}$

$$\frac{\frac{1}{29}}{\frac{41}{29}} = \frac{1}{41}$$

(SSC CHSL 03/08/2023)

$$n^2 = \frac{1681}{81} \Rightarrow n = \sqrt{\frac{1681}{81}} = \frac{41}{29} = \sin \theta - \cos \theta$$



140. If $\sin \theta - \cos \theta = \frac{7}{17}$, then find the value of $\sin \theta + \cos \theta$.

यदि $\sin \theta - \cos \theta = \frac{7}{17}$ है, तो $\sin \theta + \cos \theta$ का मान ज्ञात कीजिए।

(a) $\frac{8}{17}$

(b) $\frac{23}{13}$

(c) $\frac{23}{17}$

(d) $\frac{8}{13}$

$$\cos \theta + \sin \theta = x$$

$$1^2 + 1^2 = \left(\frac{7}{17}\right)^2 + x^2$$

$$x^2 = \frac{49}{289} + x^2$$

$$x^2 = 2 - \frac{49}{289} \Rightarrow \frac{578 - 49}{289} = \frac{529}{289}$$

$$x = \sqrt{\frac{529}{289}} = \frac{23}{17}$$

(SSC CHSL 14/10/2020)

141. If $3\sin x + 4\cos x = 2$, then find the value of $3\cos x - 4\sin x$ is :

यदि $3\sin x + 4\cos x = 2$ तो $3\cos x - 4\sin x$ का मान ज्ञात करें। $3\cos x - 4\sin x = n$

(a) $\sqrt{21}$

(b) $\sqrt{23}$

(c) 21

(d) $\sqrt{29}$

$$3^2 + 4^2 = 2^2 + n^2$$

$$9 + 16 = 4 + n^2$$

$$21 = n^2$$

(SSC CGL Pre. 18/11/2020)

$$n = \sqrt{21}$$



Questions based on some other basic identities like,

M.T. 8
(i)

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

$$= \sec A + \tan A$$

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

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

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

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

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



142. If $\frac{\sin \theta - \cos \theta + 1}{\sin \theta + \cos \theta - 1} = p \sec \theta + q \tan \theta$ where $0 < \theta < \frac{\pi}{2}$

then what is the value of $p+q$?

यदि $\frac{\sin \theta - \cos \theta + 1}{\sin \theta + \cos \theta - 1} = p \sec \theta + q \tan \theta$ जहाँ $0 < \theta < \frac{\pi}{2}$ है तो

$p + q$ का मान क्या है?

(a) 0

(b) 1

(c) 2

(d) 4

(CDS 22/04/2024)

$\rightarrow \sec \theta + \tan \theta$

$p=1 \quad q=1$

$p+q=2$



H.W

143. The value of $\frac{\sin \theta + \cos \theta - 1}{\sin \theta - \cos \theta + 1} \times \sqrt{\frac{1 + \sin \theta}{1 - \sin \theta}}$ is :

$\frac{\sin \theta + \cos \theta - 1}{\sin \theta - \cos \theta + 1} \times \sqrt{\frac{1 + \sin \theta}{1 - \sin \theta}}$ का मान ज्ञात कीजिए।

- (a) 1
- (b) -1
- (c) 2
- (d) -2

(SSC CGL Mains 16/11/2020)