10. $\cos(A+B) + \sin(A-B)$

$= \sin\left(\frac{\pi}{2} + A+B\right) + \sin(A-B)$

$= 2\sin\left(\frac{\frac{\pi}{2}+2A}{2}\right)\cos\left(\frac{\frac{\pi}{2}+2B}{2}\right)$

$\dfrac{2\left(2\sin2\theta\cos2\theta\right)\cos4\theta}{\sin2\theta}$

13. $\dfrac{\tan5\theta + \tan3\theta}{\tan5\theta - \tan3\theta} = \dfrac{\dfrac{\sin5\theta}{\cos5\theta} + \dfrac{\sin3\theta}{\cos3\theta}}{\dfrac{\sin5\theta}{\cos5\theta} - \dfrac{\sin3\theta}{\cos3\theta}} = \dfrac{\left(\dfrac{\sin8\theta}{\cos5\theta\cos3\theta}\right)}{\left(\dfrac{\sin2\theta}{\cos5\theta\cos3\theta}\right)}$

$= \dfrac{\sin⑧⑨ = (4\theta+4\theta)}{\sin2\theta} = \dfrac{\sin4\theta\cos4\theta + \sin4\theta\cos4\theta}{\sin2\theta}$

$= \dfrac{2\sin4\theta\cos4\theta}{\sin2\theta} = \dfrac{2\sin(2\theta+2\theta)\cos2\theta}{\sin2\theta}$

11. $\dfrac{-2\sin A \sin 2A}{2\sin A \cos 2A} + \dfrac{2\sin A \sin 3A}{2\sin A \cos 3A}$

$$= \dfrac{\sin 3A}{\cos 3A} - \dfrac{\sin 2A}{\cos 2A}$$

$$= \dfrac{\sin 3A \cos 2A - \sin 2A \cos 3A}{\cos 2A \cos 3A} = \dfrac{\sin A}{\cos 2A \cos 3A}$$

$$1 \quad B. \quad \frac{\Big(\sin(A-C)+\sin(A+C)\Big)+2\sin A}{\Big(\sin(B-C)+\sin(B+C)\Big)+2\sin B}$$

$$= \frac{2\sin A \cos C + 2\sin A}{2\sin B \cos C + 2\sin B} = \frac{2\sin A (\cos C + 1)}{2\sin B (\cos C + 1)}$$

$$= \frac{\sin A}{\sin B}$$

$$\tan A + \tan B = \frac{\sin A}{\cos A} + \frac{\sin B}{\cos B} = \frac{\sin A \cos B + \sin B \cos A}{\cos A \cos B}$$

$$\tan A + \tan B = \frac{\sin(A+B)}{\cos A \cos B}$$

$$\tan A - \tan B = \frac{\sin(A-B)}{\cos A \cos B}$$

$$\cot A + \cot B = \frac{\sin(A+B)}{\sin A \sin B}$$

$$\cot A - \cot B = \frac{\sin(B-A)}{\sin A \sin B}$$

19.

$$\frac{(\sin A - \sin 5A) + (\sin 9A - \sin 13A)}{(\cos A - \cos 5A) - (\cos 9A - \cos 13A)}$$

$\boxed{1569}$

$\boxed{1155} = \dfrac{(-2\sin 2A \cos 3A) + (-2\sin 2A \cos 11A)}{(2\sin 2A \sin 3A) - (2\sin 2A \sin 11A)}$

$\min\left(\begin{matrix}1155\\1569\end{matrix}\right)$

$=$

$\underbrace{\text{rank} \le \min(1155, 1569)}$

$\dfrac{\cos 3A + \cos 11A}{\sin 11A - \sin 3A} = \dfrac{2\cos 7A \cos 4A}{2\sin 4A \cos 7A}$

$3 = \max(2,3)$

$\min(2,3) = 2$

$\cot 4A$

24.

$$\frac{\left(\cos(A+B+C)+\cos(-A+B+C)\right)+\left(\cos(A-B+C)+\cos(A+B-C)\right)}{\left(\sin(A+B+C)+\sin(-A+B+C)\right)-\left(\sin(A-B+C)-\sin(A+B-C)\right)}$$

$$= \frac{2\cos(B+C)\cos A + 2\cos A \cos(B-C)}{2\sin(B+C)\cos A - 2\sin(C-B)\cos A}$$

$$= \frac{\cos(B+C)+\cos(B-C)}{\sin(B+C)+\sin(B-C)} = \frac{2\cos B \cos C}{2\sin B \cos C} = \cot B.$$

30. $\cos\left(\theta + \left(n - \frac{3}{2}\right)\phi\right) - \cos\left(\theta + \left(n + \frac{3}{2}\right)\phi\right)$

$$= 2 \sin \frac{3\phi}{2} \sin(\theta + n\phi)$$

28.

28

27. $\left(\sin 50° - \sin 70°\right) + \sin 10°$

$$= -2 \sin 10° \cancel{\cos 60°} + \sin 10°$$
$$\qquad\qquad\qquad \tfrac{1}{2}$$

$$= -\sin 10° + \sin 10° = 0$$

28.
$$\frac{\sin 10° + \sin 20° + \sin 40° + \sin 50°}{\left(\sin 10° + \sin 50°\right) + \left(\sin 20° + \sin 40°\right)}$$

$$= \; 2\sin 30° \cos 20° + 2\sin 30° \cos 10°$$

$$= \; \cos 20° + \cos 10°$$

$$= \; \sin 70° + \sin 80°$$

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

$$= \frac{\left(\dfrac{\sin A \cos B + \cos A \sin B}{\cos A \cos B}\right)}{\left(\dfrac{\cos A \cos B - \sin A \sin B}{\cos A \cos B}\right)}$$

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

Nishant Jindal

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

$$\cot(A+B) = \frac{(1 - \tan A \tan B) / \tan A \tan B}{(\tan A + \tan B) / \tan A \tan B}$$

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

$$\cot(A+B) = \frac{\cot A \cot B - 1}{\cot A + \cot B}$$

$$\cot(A-B) = \frac{\cot A \cot B + 1}{\cot B - \cot A}$$

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

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

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

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

1. $\cot 16° \cot 44° + \cot 44° \cot 76° - \cot 76° \cot 16° = ?$

$= \left(\cot 16° \cot 44° - 1\right) + \left(\cot 44° \cot 76° - 1\right) - \left(\cot 76° \cot 16° + 1\right) + 3$

$$\cot(A+B) = \frac{\cot A \cot B - 1}{\cot A + \cot B}$$

$$\cot(A-B) = \frac{\cot A \cot B + 1}{\cot B - \cot A}$$

$= \cot(16°+44°)\left(\cot 16° + \cot 44°\right) + \cot 120°\left(\cot 44° + \cot 76°\right)$

$\qquad - \cot(76°-16°)\left(\cot 16° - \cot 76°\right) + 3$

$= \dfrac{1}{\sqrt{3}}\left(\cot 16° + \cot 44°\right) - \dfrac{1}{\sqrt{3}}\left(\cot 44° + \cot 76°\right)$

$\qquad - \dfrac{1}{\sqrt{3}}\left(\cot 16° - \cot 76°\right) + 3$

$= \dfrac{1}{\sqrt{3}}\left[\cot 16° + \cot 44° - \cot 44° - \cot 76° - \cot 16° + \cot 76°\right] + 3$

3

2. P.T. $\tan 54° = \dfrac{\cos 9° + \sin 9°}{\cos 9° - \sin 9°}$

$\tan(45° + 9°) = \dfrac{\tan 45° + \tan 9°}{1 - \tan 45° \tan 9°} = \dfrac{1 + \tan 9°}{1 - \tan 9°}$

$= \dfrac{1 + \dfrac{\sin 9°}{\cos 9°}}{1 - \dfrac{\sin 9°}{\cos 9°}}$

$= \dfrac{\cos 9° + \sin 9°}{\cos 9° - \sin 9°}$

H.W

Ex - 15 (leave Q.15)

Ex - 16 (Q 5, 6, 7)