

$$\cos 2\pi = \cos \pi - 1$$

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$$\Rightarrow 1 - \cos 2\pi = \cos \pi - 1 \Rightarrow \cos 2\pi + \cos \pi - 2 = 0 \Rightarrow \begin{cases} \sin \pi = -1 \\ \sin \pi = \frac{1}{r} \checkmark \end{cases}$$

$$\Rightarrow \sin \pi = \sin \frac{\pi}{2} = \frac{1}{r} \Rightarrow \pi = \begin{cases} 2k\pi + \frac{\pi}{2} \\ 2k\pi + \pi - \frac{\pi}{2} \end{cases}$$

$$\text{ب) } \cos 2\pi + \cos \pi - 1 = 0 \Rightarrow \cos 2\pi + \cos \pi - 1 = 0$$

$$\text{ا) } \cos \pi = 1 \Rightarrow \pi = 2k\pi$$

$$\text{ب) } \sin 2\pi - \cos 2\pi = \sin \pi$$

$$\Rightarrow -\cos 2\pi = \sin 2\pi \cos \pi \Rightarrow \sin 2\pi \cos \pi + \cos 2\pi = 0$$

$$\Rightarrow \cos 2\pi (\sin 2\pi + 1) = 0 \Rightarrow \begin{cases} \cos 2\pi = 0 \Rightarrow \pi = 2k\pi \pm \frac{\pi}{2} \Rightarrow \pi = 2k\pi \pm \frac{\pi}{2} \\ \sin 2\pi = -1 \Rightarrow \pi = 2k\pi - \frac{\pi}{2} \Rightarrow \pi = 2k\pi - \frac{\pi}{2} \end{cases}$$

$$\text{ب) } \cos 2\pi - 1 + \sin 2\pi \cos \pi = 0 \Rightarrow \cos 2\pi + \sin 2\pi = 0$$

$$\frac{\sin 2\pi}{\cos 2\pi} + \tan \pi = 0 \Rightarrow \tan \pi = -1 \Rightarrow \pi = k\pi - \frac{\pi}{4} \Rightarrow \pi = k\pi - \frac{\pi}{4}$$

$$\text{ا) } \frac{\cos 2\pi (\cos \pi + 1)}{\sin \pi} = \frac{1}{\sin \pi} \Rightarrow \cos 2\pi + \cos \pi = 1$$

$$\Rightarrow \cos 2\pi + \cos \pi = 1 \Rightarrow \begin{cases} \cos \pi = 1 \Rightarrow \sin \pi = 0 \\ \cos \pi = \frac{1}{r} \Rightarrow \pi = 2k\pi \pm \frac{\pi}{2} \end{cases}$$

$$\text{ب) } \sin 2\pi - \sin \pi \cos \pi = \sin \pi \cos \pi \Rightarrow -\sin \pi \cos \pi = 1 - \sin 2\pi$$

$$\Rightarrow -\cos 2\pi = \sin \pi \cos \pi \Rightarrow \begin{cases} \cos \pi = 0 \Rightarrow \pi = 2k\pi \pm \frac{\pi}{2} \\ \sin \pi = \cos \pi \Rightarrow \tan \pi = 1 \Rightarrow \pi = k\pi + \frac{\pi}{4} \end{cases}$$

$$21) \cos\left(\frac{\pi}{r} + \lambda\right) \cos\left(\lambda - \frac{\pi}{r}\right) = \sin\left(\frac{\pi}{r} - \lambda\right) \underbrace{\cos\left(\lambda - \frac{\pi}{r}\right)}_{\cos\left(\frac{\pi}{r} - \lambda\right)} - \frac{1}{r}$$

$$= \frac{1}{r} \sin\left(\frac{\pi}{r} - \lambda\right) + \frac{1}{r} \cos \lambda = \frac{1}{r}$$

$$\Rightarrow \cos \lambda = \frac{1}{r} \Rightarrow \lambda = k\pi \pm \frac{\pi}{r} \Rightarrow \boxed{\lambda = k\pi \pm \frac{\pi}{r}}$$

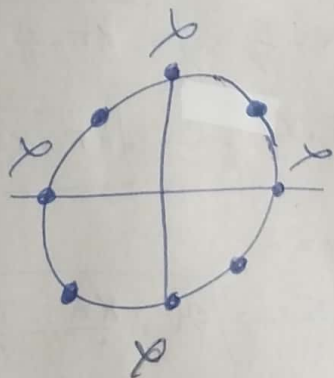
$$\hookrightarrow \cos\left(\lambda - \frac{\pi}{r}\right) = -\sin \lambda = \sin(-\lambda) = \cos\left(\frac{\pi}{r} + \lambda\right)$$

$$\Rightarrow \lambda - \frac{\pi}{r} = k\pi + \frac{\pi}{r} + \lambda \quad \text{öcc}$$

$$\left\{ \begin{array}{l} \lambda - \frac{\pi}{r} = k\pi - \frac{\pi}{r} - \lambda \Rightarrow \sin \lambda = k\pi - \frac{\pi}{r} \Rightarrow \lambda = \frac{k\pi}{r} - \frac{\pi}{r} \\ \lambda - \frac{\pi}{r} = k\pi + \frac{\pi}{r} - \lambda \Rightarrow \sin \lambda = k\pi + \frac{\pi}{r} \Rightarrow \lambda = \frac{k\pi}{r} + \frac{\pi}{r} \end{array} \right.$$

$$\frac{\sin \lambda + \sin \lambda}{\sin \lambda} - \sin \lambda = \cos \lambda \quad - 8$$

$$\Rightarrow \frac{\sin \lambda + \sin \lambda}{\sin \lambda} = 1 \Rightarrow \left\{ \begin{array}{l} \sin \lambda = 0 \Rightarrow \lambda = k\pi \pm \frac{\pi}{r} \\ \sin \lambda \neq 0 \Rightarrow \lambda = \frac{k\pi}{r} \pm \frac{\pi}{r} \end{array} \right.$$



$$\lambda = \frac{k\pi}{r} + \frac{\pi}{r} \in [-\pi, \pi]$$

$$\frac{\sin \frac{\pi}{r}}{1 + \cos \frac{\pi}{r}} + \frac{1}{\sin \frac{\pi}{r}} + \frac{\cos \frac{\pi}{r}}{\sin \frac{\pi}{r}} + \frac{1 + \cos \frac{\pi}{r}}{\sin \frac{\pi}{r}} \quad - 9$$

$$\Rightarrow \sin \frac{\pi}{r} = 1 + \cos \frac{\pi}{r} + \cos \frac{\pi}{r} \Rightarrow 1 - \cos \frac{\pi}{r} = 1 + \cos \frac{\pi}{r} + \cos \frac{\pi}{r}$$

$$\Rightarrow \cos \frac{\pi}{r} + \cos \frac{\pi}{r} = 0 \Rightarrow \left\{ \begin{array}{l} \cos \frac{\pi}{r} = 0 \\ \cos \frac{\pi}{r} = -1 \end{array} \right. \quad \text{öcc: } \cos \frac{\pi}{r} = 0$$

$$\Rightarrow \cos \frac{\pi}{r} = 0 \Rightarrow \frac{\pi}{r} = k\pi \pm \frac{\pi}{2} \Rightarrow \lambda = k\pi \pm \frac{\pi}{2}$$

$$\Rightarrow \lambda = -\pi, \pi \Rightarrow |\pi - (-\pi)| = 2\pi$$

$$\cos^2 \lambda - \sin^2 \lambda \cos^2 \lambda = 1$$

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$$\Rightarrow \sin^2 \lambda \cos^2 \lambda (\cos^2 \lambda - 1) = -\sin^2 \lambda \Rightarrow \sin^2 \lambda \cos^2 \lambda + \sin^2 \lambda = 0$$

$$\Rightarrow \sin^2 \lambda (\cos^2 \lambda + 1) = 0 \Rightarrow \left\{ \begin{array}{l} \sin^2 \lambda = 0 \Rightarrow \sin \lambda = 0 \Rightarrow \lambda = k\pi \\ \cos^2 \lambda + 1 = 0 \Rightarrow \cos^2 \lambda = -1 \Rightarrow \lambda = k\pi + \frac{\pi}{2} \end{array} \right. \Rightarrow \lambda = \frac{k\pi}{2} + \frac{\pi}{4}$$

$$\Rightarrow \lambda \in \left\{ 0, k\pi, \frac{k\pi}{2}, k\pi + \frac{\pi}{2} \right\} \subset \mathbb{R}$$

$$\frac{1 - \tan \lambda}{1 + \tan \lambda}, \tan\left(\frac{\pi}{2} - \lambda\right) = \tan \lambda$$

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$$\Rightarrow \lambda = k\pi + \frac{\pi}{2} - \lambda \Rightarrow \lambda = k\pi + \frac{\pi}{4} \Rightarrow \lambda = \frac{k\pi}{2} + \frac{\pi}{4}$$

$$\sqrt{1 + \sin^2 \lambda} = \sqrt{r} \cos^2 \lambda \Rightarrow 1 + \sin^2 \lambda = r \cos^2 \lambda$$

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$$\begin{array}{l} 1 + \sin^2 \lambda \geq 0 \\ \cos^2 \lambda \geq 0 \end{array} \checkmark$$

$$\Rightarrow \sin^2 \lambda = \cos^2\left(\frac{\pi}{2} - \lambda\right) = r \cos^2 \lambda - 1 = \cos^2 \lambda$$

$$\Rightarrow \lambda = k\pi + \frac{\pi}{2} - \lambda \Rightarrow \lambda = \frac{k\pi}{2} + \frac{\pi}{4}$$

$$\lambda = k\pi + \lambda - \frac{\pi}{2} \Rightarrow \lambda = k\pi - \frac{\pi}{4}$$

$$\lambda = \frac{k\pi + \pi}{2} \Rightarrow \lambda \in \left\{ \frac{k\pi}{2}, \frac{k\pi}{2} + \frac{\pi}{2} \right\}$$

$$\lambda = \frac{k\pi - \pi}{2} \Rightarrow \lambda \in \left\{ \frac{k\pi}{2} - \frac{\pi}{2} \right\}$$

$$\lambda \in \left\{ \frac{k\pi}{2}, \frac{k\pi}{2} + \frac{\pi}{2}, \frac{k\pi}{2} - \frac{\pi}{2} \right\}$$

$$\sin^2 \lambda - \cos^2 \lambda = (\sin \lambda - \cos \lambda)(\sin \lambda + \cos \lambda) = 1$$

$$\Rightarrow -\cos^2 \lambda = 1 \Rightarrow \cos^2 \lambda = -1 \Rightarrow \lambda = k\pi + \frac{\pi}{2} \Rightarrow \lambda = \frac{k\pi}{2} + \frac{\pi}{4}$$

$$\sin^2 \lambda - \cos^2 \lambda = -1 \Rightarrow \left\{ \begin{array}{l} \sin^2 \lambda = 1 \\ \cos^2 \lambda = 0 \end{array} \right. \Rightarrow \lambda = k\pi + \frac{\pi}{2}$$

$$\left\{ \begin{array}{l} \sin^2 \lambda = 0 \\ \cos^2 \lambda = 1 \end{array} \right. \Rightarrow \lambda = k\pi$$

