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$k\sin\alpha = \sin(2x-\alpha)$

$\boxed{-1 \le k\sin\alpha \le 1}$

$2x-\alpha = n\pi$

$x \in (0, \pi)$

$\boxed{\sin x = 0}$

$\sin\left(\frac{\pi}{4} + \frac{\sqrt{x}}{2}\right) = \sin\sqrt{x}$

$\boxed{\alpha = 2x - n\pi}$

$-n\pi < \alpha < 2\pi - n\pi$

$\left((1+k)\left(\cos(3x-\alpha) + \cos(x-\alpha)\right)\right) = 2\cos(x-\alpha) + \left(k\left(\cos(3x-\alpha) + \cos(x+\alpha)\right)\right)$

$\Rightarrow k\left(\cos(x-\alpha) - \cos(x+\alpha)\right) = \cos(x-\alpha) - \cos(3x-\alpha)$

$2k\sin x\sin\alpha = 2\sin x\sin(2x-\alpha)$

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$$(1-\cos 2x)^5 + (1+\cos 2x)^5 = 58$$
$$= 29$$

$$\frac{d}{dx}(f(x)) = 0 \ \forall x \in R$$

$$x\cos^3 y + 3x\cos y\sin^2 y = 14$$

$$x\sin^3 y + 3x\cos^2 y\sin y = 13$$

$$x(\cos y + \sin y)^3 = 27$$

$$x(\cos y - \sin y)^3 = 1$$

$\tan^4\theta$

$$= \frac{(3+2\tan^2\theta) - \tan^2 x\tan^2\theta}{\tan^2 x - \tan^2\theta}$$

$$\boxed{\tan^2\theta = 3}$$

$$x - \cancel{y} - \cancel{x^2 y} + xy^2 + x - x^3y^2$$
$$+ x + \cancel{y} + \cancel{x^2 y} + xy^2$$

$$\frac{3\tan x + 2\tan x\tan^2\theta - \tan^3 x\tan^2\theta}{(\tan^2 x - \tan^2\theta)\tan x} = \frac{\frac{\tan x - \tan\theta}{1+\tan x\tan\theta} + \tan x + \frac{\tan x + \tan\theta}{1 - \tan x\tan\theta}}{\frac{(\tan^2 x - \tan^2\theta)\tan x}{(1 - \tan^2 x\tan^2\theta)}}$$

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19.

$$\sin x \cos 2x = \sin 2x \cos 3x - \frac{1}{2}\sin 5x$$

$$\sin 3x - \cancel{\sin x} = \cancel{\sin 5x} - \cancel{\sin x} - \cancel{\sin 5x} \Rightarrow \boxed{\sin 3x = 0}$$

$$\frac{n\pi}{3}$$

$$\sin x\,(\underline{3 - 4\sin^2 x})$$

$$a\cos 2x + |a|\cos 4x = 1 - \cos 6x$$

$$= 2\sin^2 3x$$

$$\boxed{(a \in -\infty, -1) \cup \{0\}}$$

$$a + |a| = 0 \Rightarrow \boxed{a \le 0}$$

at $x = n\pi$

$$2a\sin 3x \sin x = 2\sin^2 3x$$

$$[3-4, 3]$$

$$a\sin x = \sin 3x$$

$$a = \underbrace{3 - 4\sin^2 x}$$

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$$\cos\left(\frac{\pi}{2} - \cos x\right) = \cos(\sin x)$$

$$\sin x = 2n\pi + \frac{\pi}{2} - \cos x \quad \text{or} \quad 2n\pi - \frac{\pi}{2} + \cos x$$

$$\sin x + \cos x = 2n\pi + \frac{\pi}{2} \quad \text{or} \quad \sin x - \cos x = 2n\pi - \frac{\pi}{2}.$$

$-1 \quad -1$

$1 \quad 1$

12. $\sin x \cos 2y = (a^2 - 1)^2 + 1 \geq 1$

$$\boxed{\begin{aligned} \sin x \cos 2y &= 1 \\ \cos x \sin 2y &= 0 \end{aligned}}$$

$a = -1$

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$$\alpha+\beta = \tan\theta - 2$$

$$\alpha\beta = -1-\tan\theta$$

$$\alpha+\beta+\alpha\beta = -3$$

$$(\alpha+1)(\beta+1) = -2$$

-2	1
2	-1
-1	2
1	-2

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1\. Simplify

$$\begin{vmatrix} 1 & \sin 3\theta & \sin^3\theta \\ 2\cos\theta & \sin 6\theta & \sin^3 2\theta \\ 4\cos^2\theta - 1 & \sin 9\theta & \sin^3 3\theta \end{vmatrix} \xrightarrow{C_2 \to C_2 - 3\sin\theta C_1 + 4C_3}$$

$4\cos^2\theta - 1 = 3 - 4\sin^2\theta$

$= 0$

$$\begin{vmatrix} (b+c)^2 & a^2 & bc \\ (c+a)^2 & b^2 & ca \\ (a+b)^2 & c^2 & ab \end{vmatrix} \xrightarrow{C_1 \to C_1 + C_2 - 2C_3} (a^2+b^2+c^2) \begin{vmatrix} 1 & a^2 & bc \\ 1 & b^2 & ca \\ 1 & c^2 & ab \end{vmatrix}$$

$$= \frac{(a^2+b^2+c^2)}{abc} \begin{vmatrix} a & a^3 & abc \\ b & b^3 & abc \\ c & c^3 & abc \end{vmatrix}$$

$$= (a^2+b^2+c^2) \begin{vmatrix} a & a^3 & 1 \\ b & b^3 & 1 \\ c & c^3 & 1 \end{vmatrix}$$

$$= (a^2+b^2+c^2) \begin{vmatrix} 1 & a & a^3 \\ 1 & b & b^3 \\ 1 & c & c^3 \end{vmatrix}$$

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

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$$\Delta = \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = (x-y)(y-z)(z-x)$$

$$\xrightarrow[R_3 \to R_3 - R_1]{R_2 \to R_2 - R_1} (y-x)(z-x) \begin{vmatrix} 1 & x & x^2 \\ 0 & 1 & y+x \\ 0 & 1 & z+x \end{vmatrix} = (y-x)(z-x)(z-y)$$

Put $y=x$
$y=z$
$z=x$
$\boxed{\Delta = 0}$

$$\begin{vmatrix} 1 & x & x^3 \\ 1 & y & y^3 \\ 1 & z & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(x+y+z)$$

$$\Delta = K(x-y)(y-z)(z-x)$$

$x=0,\ y=1,\ z=-1$

$$K = 1 \Leftarrow K(-1)(2)(-1) = \begin{vmatrix} 1 & 0 & 0 \\ 1 & 1 & 1 \\ 1 & -1 & 1 \end{vmatrix} = 2$$

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$$\begin{vmatrix} 1 & x^2 & x^3 \\ 1 & y^2 & y^3 \\ 1 & z^2 & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$$

$$\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = 3abc - a^3 - b^3 - c^3$$

$R_1 \to R_1 + R_2 + R_3$

$$(a+b+c)\begin{vmatrix} 1 & 1 & 1 \\ b & c & a \\ c & a & b \end{vmatrix}$$

$a(bc-a^2) - b(b^2-ac) + c(ab-c^2)$

$C_2 \to C_2 - C_1$

$C_3 \to C_3 - C_1$

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3: P.T. $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$

$$= abc\begin{vmatrix} 1+\frac{1}{a} & \frac{1}{a} & \frac{1}{a} \\ \frac{1}{b} & 1+\frac{1}{b} & \frac{1}{b} \\ \frac{1}{c} & \frac{1}{c} & 1+\frac{1}{c} \end{vmatrix} \xrightarrow{R_1 \to R_1+R_2+R_3} abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)\begin{vmatrix} 1 & 1 & 1 \\ \frac{1}{b} & 1+\frac{1}{b} & \frac{1}{b} \\ \frac{1}{c} & \frac{1}{c} & 1+\frac{1}{c} \end{vmatrix}$$

$C_2 \to C_2 - C_1$

$C_3 \to C_3 - C_1$

$$\boxed{abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)\begin{vmatrix} 1 & 0 & 0 \\ \frac{1}{b} & 1 & 0 \\ \frac{1}{c} & 0 & 1 \end{vmatrix}$$

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Trig. Eqn

$\boxed{\text{Ex-III, IV}}$ ✓