① $\cot\alpha = \frac{\cos\alpha}{\sqrt{1-\cos^2\alpha}}$ $\qquad \frac{1}{\sqrt{\cos^2\alpha}} - \frac{1}{\cot\alpha} = \frac{1-\sin\alpha}{|\cos\alpha|}$

$\cot\alpha = \frac{\cos\alpha}{|\sin\alpha|} \Rightarrow \sin\alpha > 0$ $\qquad \frac{1}{|\cos\alpha|} - \frac{\sin\alpha}{\cos\alpha} = \frac{1-\sin\alpha}{|\cos\alpha|} \to \cos\alpha > 0 \Rightarrow$ **نادرست اول**

---

②

$-\frac{\pi}{12} < x < \frac{5\pi}{12} \longrightarrow -\frac{\pi}{6} < 2x < \frac{5\pi}{6} \longrightarrow -\frac{1}{2} < \sin 2x \leq 1$

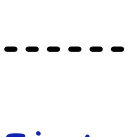
$-\frac{1}{2} < \frac{m-1}{4} \leq 1 \longrightarrow -2 < m-1 \leq 4 \longrightarrow \boxed{-1 < m \leq 5}$

---

③

$\sin^3 x + \cos^3 x = (\sin x + \cos x)(1 - \sin x \cos x)$ $\qquad \frac{1}{\sin^3 x + \cos^3 x} = \frac{1}{(\sin x + \cos x)(1-\sin x\cos x)} = \frac{1}{-\frac{1}{\sqrt{2}} \times \frac{3}{2}} = \boxed{-\frac{2\sqrt{2}}{3}}$

$\tan x + \cot x = \frac{1}{\sin x \cos x} = -2 \longrightarrow \sin x \cos x = -\frac{1}{2}$

$(\sin x + \cos x)^2 = 1 + 2\sin x \cos x = \frac{1}{2} \longrightarrow$  $\Rightarrow \sin x + \cos x < 0 \Rightarrow \sin x + \cos x = -\frac{1}{\sqrt{2}}, 1 - \sin x \cos x = \frac{3}{2}$

---

④

$\cos\theta = 0.4 \longrightarrow \cot\theta = \frac{3}{4}$

$\frac{1.5}{x} = \frac{3}{4} \longrightarrow x = 2$

$S_{\square} = \frac{(2+3)\times 2}{2} = \boxed{5}$

---

⑤ $\tan(270^\circ)\tan(-135^\circ) - \sin(630^\circ)\cos(225^\circ)$

$\tan\left(\frac{3\pi}{2}+\alpha\right)\tan(\pi+\alpha) - \sin\alpha\cos\left(\frac{3\pi}{2}-\alpha\right) = \underbrace{-\cot\alpha\tan\alpha}_{-1} + \sin^2\alpha = -\cos^2\alpha \Rightarrow k = \boxed{-1}$

---

⑥ $\sqrt{3} \times \left(-\frac{\sqrt{3}}{2}\right) \times (-\cos\alpha) - \sqrt{2} \times \left(\frac{\sqrt{2}}{2}\right) \times (\cos\alpha) = 1.5\cos\alpha - \cos\alpha = 0.5\cos\alpha$

---

⑦ $f(x) = \cancel{16}\cos^2(3x)\cos^2(6x)\cos^2(12x)\cos^2(24x) = \frac{3}{8}\cos^2\frac{\pi}{12}$

$\cos(3x) \to \frac{3}{4}$ $\qquad \cos(12x) \to \frac{1}{\cancel{16}}$

$\cos^2\frac{\pi}{12} = \frac{1+\frac{\sqrt{3}}{2}}{2} = \frac{2+\sqrt{3}}{4}$ $\qquad \boxed{\frac{6+3\sqrt{3}}{16}}$

---

⑧ $1 - \sin x = 4 + 4\sin x \longrightarrow \sin x = -\frac{3}{5}, \cos x = -\frac{4}{5} \longrightarrow \tan\frac{x}{2} = \frac{-\frac{3}{5}}{1-\frac{4}{5}} = \boxed{-3}$

---

⑨ $\frac{\sin\theta}{1+\cos\theta} + \frac{1-\cos\theta}{\sin\theta} = \cot\frac{\theta}{2} + \cot\frac{\theta}{2} = 2\cot\frac{\theta}{2} \longrightarrow \boxed{k=2}$

---

⑩ $\cos\left(\frac{3\pi}{4}+\alpha\right) = \cos\frac{3\pi}{4}\cos\alpha - \sin\frac{3\pi}{4}\sin\alpha = \left(-\frac{\sqrt{2}}{2}\right)\left(-\frac{\sqrt{2}}{10}\right) - \left(\frac{\sqrt{2}}{2}\right)\left(\frac{\sqrt{2}}{10}\right) = \frac{1}{5} + \frac{1}{10} = \boxed{\frac{3}{5}}$

$\cos\alpha = -\frac{\sqrt{2}}{10}$ $\qquad \sin\alpha = \frac{\sqrt{98}}{10}$