$$\cos(2\alpha) = 3(\cos^3(\alpha) + \sin^3(\alpha))$$
$$\cos^2(\alpha) - \sin^2(\alpha) = 3(\cos^3(\alpha) + \sin^3(\alpha))$$
$$(\cos(\alpha) - \sin(\alpha)) * (\cos(\alpha) + \sin(\alpha)) = 3(\cos(\alpha) + \sin(\alpha)) * (\cos^2(\alpha) - \cos(\alpha) * \sin(\alpha) + \sin^2(\alpha))$$
$$(\cos(\alpha) + \sin(\alpha)) * ((\cos(\alpha) - \sin(\alpha)) - 3 * (1 - \cos(\alpha) * \sin(\alpha))) = 0$$
$$\cos(\alpha) + \sin(\alpha) = 0 \Rightarrow \alpha_1 = \frac{3\pi}{4} + \pi * k$$
$$((\cos(\alpha) - \sin(\alpha)) - 3 * (1 - \cos(\alpha) * \sin(\alpha))) = 0$$
$$(\cos(\alpha) - \sin(\alpha)) = t$$
$$t^2 = 1 - 2 * \cos(\alpha) * \sin(\alpha)$$
$$\cos(\alpha) * \sin(\alpha) = \frac{1 - t^2}{2}$$
$$t - 3 * \left(1 - \frac{1 - t^2}{2}\right) = 0$$
$$2t - 3 * (1 + t^2) = 0$$
$$3t^2 - 2t + 3 = 0$$
$$D = 4 - 36 < 0$$
$$\alpha_2 \notin \{R\}$$
****
$$\alpha = \frac{3\pi}{4} + \pi * k$$

$$tg(x) + ctg(x) = t$$
$$t^2 = tg^2(x) + ctg^2(x) + 2$$
$$tg^2(x) + ctg^2(x) = t^2 - 2$$
$$t^3 = tg^3(x) + 3tg^2(x)ctg(x) + 3tg(x)ctg^2(x) + ctg^3(x) = tg^3(x) + 3(tg(x) + ctg(x)) + ctg^3(x)$$
$$tg^3(x) + ctg^3(x) = t^3 - 3t$$
$$tg(x) + ctg(x) + tg^2(x) + ctg^2(x) + tg^3(x) + ctg^3(x) = t + t^2 - 2 + t^3 - 3t = t^2 - 2 + t^3 - 2t = 6$$
$$t^3 + t^2 - 2t - 8 = 0$$
$$t^3 - 2t^2 + 3t^2 - 6t + 4t - 8 = 0$$
$$(t - 2)t^2 + (t - 2) * 3t + (t - 2) * 2 = 0$$
$$(t - 2)(t^2 + 3t + 2) = 0$$
$$(t - 2)(t + 1)(t + 2) = 0$$
$$\begin{cases} tg(x) + ctg(x) = 2 \Rightarrow tg(x) = 1 \\ tg(x) + ctg(x) = -1 \Rightarrow tg(x) \notin \{R\} \Rightarrow x = \dfrac{\pi}{4} + \pi * k \\ tg(x) + ctg(x) = -2 \Rightarrow tg(x) = -1 \end{cases}$$