$\boxed{\begin{matrix}3.76\\ №8\end{matrix}}$ I

$$1+i\tan\alpha = \frac{\cos\alpha + i\sin\alpha}{\cos\alpha} = \frac{\operatorname{cis}\alpha}{\cos\alpha}$$

$$1-i\tan\alpha = \frac{\cos\alpha - i\sin\alpha}{\cos\alpha} = \frac{\cos(-\alpha)+i\sin(-\alpha)}{\cos\alpha} = \frac{\operatorname{cis}(-\alpha)}{\cos\alpha}$$

$$z = \left(\frac{1+i\tan\alpha}{1-i\tan\alpha}\right)^3 = \left(\frac{\frac{\operatorname{cis}\alpha}{\cancel{\cos\alpha}}}{\frac{\operatorname{cis}(-\alpha)}{\cancel{\cos\alpha}}}\right)^3 = (\operatorname{cis}2\alpha)^3 = \operatorname{cis}6\alpha$$

$\theta = 6\alpha$, $r = 1$

II $\left(\frac{1+i\sqrt{3}}{1-i\sqrt{3}}\right)^3 = \left(\frac{1+i\tan 60}{1-i\tan 60}\right)^3 = \operatorname{cis}360$ [illegible]

$$z^4 = -\operatorname{cis}360 = -1 = \operatorname{cis}180 = \operatorname{cis}\pi$$

$$z_i = \operatorname{cis}\left(\frac{\pi}{4} + \frac{\pi k}{2}\right) \qquad k = 0,1,2,3$$

$\boxed{\begin{matrix}3.76\\ №9\end{matrix}}$ I $z = 1+\cos\varphi + i\sin\varphi$

$$|z| = \sqrt{(1+\cos\varphi)^2 + \sin^2\varphi} = \sqrt{1+2\cos\varphi+\sin^2\varphi+\cos^2\varphi} = \sqrt{2+2\cos\varphi} =$$

$$= \sqrt{2\cdot(1+\cos\varphi)} = \sqrt{2\cdot 2\cos^2\frac{\varphi}{2}} = 2\cos\frac{\varphi}{2}$$

$\arg z$: $\tan\alpha = \frac{\sin\varphi}{1+\cos\varphi} = \frac{\sin\varphi}{2\cos^2\frac{\varphi}{2}} = \frac{2\sin\frac{\varphi}{2}\cos\frac{\varphi}{2}}{2\cos^2\frac{\varphi}{2}} = \tan\frac{\varphi}{2}$

$$\alpha = \frac{\varphi}{2}$$

II $z = 2\cos\frac{60}{2}\cdot\operatorname{cis}\frac{60}{2} = 2\cos30\cdot\operatorname{cis}30 = \sqrt{3}\operatorname{cis}30$

$$z^8 = 3^4\operatorname{cis}240 = 81\left(-\frac{1}{2}-\frac{\sqrt{3}}{2}i\right) = -\frac{81}{2}(1+\sqrt{3}i)$$

$$\sqrt[3]{z} = \sqrt[3]{\sqrt{3}\operatorname{cis}30} = \sqrt[6]{3}\operatorname{cis}(10+120k) \qquad k=0,1,2$$