(e) $z = \left(\frac{i+\sqrt{3}}{i(\sqrt{3}-i)}\right)^{22}$

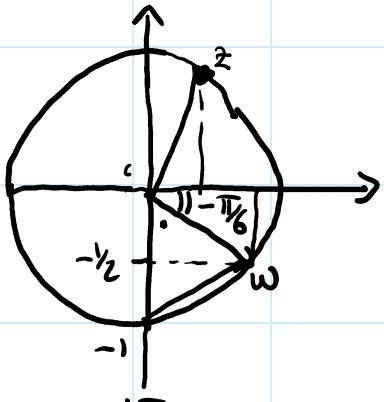
$$\left(\frac{i+\sqrt{3}}{i(\sqrt{3}-i)}\right)^{22} \qquad w = \rho e^{i\theta} \qquad w^{22} = \rho^{22} e^{i22\theta}$$

$$w = \frac{i+\sqrt{3}}{i(\sqrt{3}-i)} = \frac{i+\sqrt{3}}{i\sqrt{3}-i^2} = \frac{\sqrt{3}+i}{1+i\sqrt{3}} = \frac{\sqrt{3}+i}{1+i\sqrt{3}} \cdot \frac{1-i\sqrt{3}}{1-i\sqrt{3}} =$$

$$= \frac{(\sqrt{3}+i)(1-i\sqrt{3})}{1+3} = \frac{\sqrt{3}-3i+i+\sqrt{3}}{4} = \frac{2\sqrt{3}-2i}{4} =$$

($i^2=-1$)

$$= \frac{\sqrt{3}}{2} - \frac{i}{2} \qquad \begin{cases} a = \frac{\sqrt{3}}{2} \\ b = -\frac{1}{2} \end{cases} \qquad |w| = \sqrt{a^2+b^2} = \sqrt{\frac{3}{4}+\frac{1}{4}} = 1$$



$$w = \frac{\sqrt{3}}{2} - \frac{1}{2}i = 1 \cdot e^{-i\frac{\pi}{6}} = e^{-i\pi/6}$$

$$4\pi - \frac{11}{3}\pi = \frac{12-11}{3}\pi$$

$$z = w^{22} = e^{-i\frac{\pi}{6}\cdot 22} = e^{-i\pi\frac{11}{3}} = e^{i\frac{\pi}{3}}$$

$$= \frac{1}{2} + i\frac{\sqrt{3}}{2}.$$