$$= 2^{1/2}\left[\cos\left[\frac{8k+7}{4}\right]\pi + i\sin\left[\frac{8k+7}{4}\right]\pi\right]$$

$$= z^{1/3} = 2^{1/6}\left[\cos\left[\frac{8k+7}{4}\right]\pi + i\sin\left[\frac{8k+7}{4}\right]\pi\right]^{1/3}$$

$$z_k = z^{1/3} = 2^{1/6}\left[\cos\left[\frac{8k+7}{12}\right]\pi + i\sin\left[\frac{8k+7}{12}\right]\pi\right] \quad \text{where } k=0,1,2.$$

$$z_0 = 2^{1/6}\left[\cos\frac{7\pi}{12} + i\sin\left[\frac{7\pi}{12}\right]\right]$$

$$z_1 = 2^{1/6}\left[\cos\frac{15\pi}{12} + i\sin\frac{15\pi}{12}\right]$$

$$z_2 = 2^{1/6}\left[\cos\frac{23\pi}{12} + i\sin\frac{23\pi}{12}\right]$$

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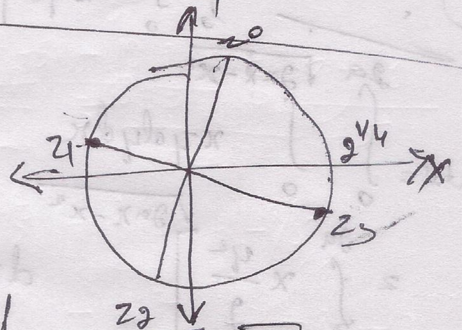
(2) $1-i\sqrt{3}$ $\boxed{\text{4th roots}}$



let $z = 1-i\sqrt{3} = x+iy$

$$\boxed{r} = \sqrt{x^2+y^2} = \sqrt{1+3} = 2$$

$$\boxed{\alpha} = \tan^{-1}\left|\frac{y}{x}\right| = \tan^{-1}\left|\frac{-\sqrt{3}}{1}\right| = \tan^{-1}\sqrt{3} = \frac{\pi}{3}.$$

Here $z = 1-i\sqrt{3} = (1,-\sqrt{3})$ is in 4th quadrant.

$(+,-)$ $\boxed{\theta} = 2\pi - \alpha = 2\pi - \frac{\pi}{3} = \frac{5\pi}{3}$

therefore, $z = 2\left[\cos\frac{5\pi}{3} + i\sin\frac{5\pi}{3}\right]$

or $z = 2\left[\cos\left(2k\pi + \frac{5\pi}{3}\right) + i\sin\left(2k\pi + \frac{5\pi}{3}\right)\right]$

$$z = 2\left[\cos\left[\frac{6k+5}{3}\right]\pi + i\sin\left[\frac{6k+5}{3}\right]\pi\right]$$

therefore, $z_k = z^{1/4} = 2^{1/4}\left[\cos\left[\frac{6k+5}{3}\right]\pi + i\sin\left[\frac{6k+5}{3}\right]\pi\right]^{1/4}$

$$z_k = 2^{1/4}\left[\cos\left[\frac{6k+5}{12}\right]\pi + i\sin\left[\frac{6k+5}{12}\right]\pi\right] \quad \text{where } k=0,1,2,3.$$

4th root

$$z_0 = 2^{1/4}\left[\cos\left[\frac{5\pi}{12}\right] + i\sin\left(\frac{5\pi}{12}\right)\right]$$

$$z_2 = 2^{1/4}\left[\cos\frac{17\pi}{12} + i\sin\frac{17\pi}{12}\right]$$

$$z_1 = 2^{1/4}\left[\cos\frac{11\pi}{12} + i\sin\frac{11\pi}{12}\right]$$

$$z_3 = 2^{1/4}\left[\cos\frac{23\pi}{12} + i\sin\frac{23\pi}{12}\right]$$