12. $x^4 = 4-4i$

$\sqrt[4]{x^4} = \sqrt[4]{4-4i}$

$x = \sqrt[4]{4-4i}$

$4-4i$

$x=4 \quad y=-4$

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

$r = \sqrt{4^2+(-4)^2}$

$r = \sqrt{16+16}$

$r = \sqrt{32}$

$r = \sqrt{4 \cdot 4 \cdot 2}$

$r = 4\sqrt{2}$

$\cos\theta = \frac{x}{r} = \frac{4}{4\sqrt{2}} = \frac{1}{\sqrt{2}} = \frac{\sqrt{2}}{2}$

$\sin\theta = \frac{y}{r} = \frac{-4}{4\sqrt{2}} = \frac{-1}{\sqrt{2}} = \frac{-\sqrt{2}}{2}$

$\theta = 315^\circ$

so

$r(\cos\theta + i\sin\theta)$

$4\sqrt{2}(\cos 315^\circ + i \sin 315^\circ)$

COMPLEX FOURTH ROOTS of $4\sqrt{2}(\cos 315^\circ + i \sin 315^\circ)$

① FIND $\sqrt[n]{r}$

$$\sqrt[n]{r} = \sqrt[4]{4\sqrt{2}} = \sqrt[4]{\sqrt{32}} = \sqrt[8]{32}$$

② FIND INITIAL ANGLE

$$IA = \frac{315^\circ}{4} = 78.75^\circ$$

③ FIND ADD FACTOR

$$AF = \frac{360^\circ}{n} = \frac{360^\circ}{4} = 90^\circ$$

④ 1ST ANSWER: $\sqrt[n]{r}(\cos IA + i \sin IA)$

$\sqrt[8]{32}(\cos 78.75^\circ + i \sin 78.75^\circ)$

$+90^\circ \qquad +90^\circ$

$\sqrt[8]{32}(\cos 168.75^\circ + i \sin 168.75^\circ)$

$+90^\circ \qquad +90^\circ$

$\sqrt[8]{32}(\cos 258.75^\circ + i \sin 258.75^\circ)$

$+90^\circ \qquad +90^\circ$

$\sqrt[8]{32}(\cos 348.75^\circ + i \sin 348.75^\circ)$