

$$\begin{aligned}
 (a) \quad 3e^{j\pi/3} + 4e^{-j\pi/6} &= \left(\frac{3}{2} + j\frac{3\sqrt{3}}{2}\right) + \left(\frac{4\sqrt{3}}{2} - j\frac{4}{2}\right) \\
 &= 4.9641 + j0.5981 \\
 &= 5e^{j0.12}
 \end{aligned}$$

NOTE: $0.12 \text{ rad} = 6.87^\circ$

$$(b) \quad \sqrt{3} - j3 = \sqrt{3+3^2} e^{-j\pi/3} = \sqrt{12} e^{-j\pi/3}.$$

$$\begin{aligned}
 \Rightarrow (\sqrt{3} - j3)^{10} &= (\sqrt{12} e^{-j\pi/3})^{10} \\
 &= 2^{10} 3^5 e^{-j10\pi/3} \quad -\frac{10\pi}{3} + 4\pi = \frac{-10\pi + 12\pi}{3} = \frac{2\pi}{3} \\
 &= 248,832 e^{+j2\pi/3} = -124,416 + j215,494.83
 \end{aligned}$$

$$\begin{aligned}
 (c) \quad \frac{1}{\sqrt{3} - j3} &= \frac{1}{\sqrt{12} e^{-j\pi/3}} = \frac{1}{\sqrt{12}} e^{+j\pi/3} = 0.2887 e^{+j\pi/3} \\
 &= 0.14434 + j0.25
 \end{aligned}$$

$$\begin{aligned}
 (d) \quad (\sqrt{3} - j3)^{1/3} &= (\sqrt{12} e^{-j\pi/3})^{1/3} = (\sqrt{12} e^{-j(\pi/3 + 2\pi\ell)})^{1/3} \\
 &= 12^{1/6} e^{-j(\pi/9 + 2\pi\ell/3)} \quad \ell = \text{integer} \\
 &\quad \text{Need } \ell = 0, 1, 2
 \end{aligned}$$

There are 3 answers:

$$1.513 e^{-j\pi/9} = 1.422 - j0.5175$$

$$1.513 e^{-j7\pi/9} = -1.159 - j0.9726$$

$$1.513 e^{-j13\pi/9} = 1.513 e^{+j5\pi/9} = -0.2627 + j1.49$$

$$\begin{aligned}
 (e) \quad \operatorname{Re}\{je^{-j\pi/3}\} &= \operatorname{Re}\{e^{j\pi/2} e^{-j\pi/3}\} \\
 &= \operatorname{Re}\{e^{j\pi/6}\} = \cos(\pi/6) = \frac{\sqrt{3}}{2} = 0.866
 \end{aligned}$$