

$$\begin{aligned}
10. & \left[ 2(\cos 105^\circ + i \sin 105^\circ) \right]^4 \\
&= 2^4 (\cos(4 \cdot 105^\circ) + i \sin(4 \cdot 105^\circ)) \\
&= 16 (\cos 420^\circ + i \sin 420^\circ) \\
&= 16 (\cos(420^\circ - 360^\circ) + i \sin(420^\circ - 360^\circ)) \\
&= 16 (\cos 60^\circ + i \sin 60^\circ) \\
&= 16 \left( \frac{1}{2} + i \left( \frac{\sqrt{3}}{2} \right) \right) \\
&= \frac{16}{2} + \frac{16\sqrt{3}}{2} i \\
&= \boxed{8 + 8\sqrt{3}i}
\end{aligned}$$

$(\sqrt{2})^2 = 2$

$$\begin{aligned}
11. & \left[ \sqrt{2} \left( \cos \frac{3\pi}{20} + i \sin \frac{3\pi}{20} \right) \right]^{10} \\
&= (\sqrt{2})^{10} \left( \cos \left( 10 \cdot \frac{3\pi}{20} \right) + i \sin \left( 10 \cdot \frac{3\pi}{20} \right) \right) \\
&= 32 \left( \cos \frac{30\pi}{20} + i \sin \frac{30\pi}{20} \right) \\
&= 32 \left( \cos \frac{3\pi}{2} + i \sin \frac{3\pi}{2} \right) \\
&= 32 (0 + i(-1)) \\
&= \boxed{-32i}
\end{aligned}$$