

66. (a)

$$\begin{aligned}nn^* &= (a+ib)(a+ib)^* = (a+ib)(a^*+i^*b^*) = (a+ib)(a-ib) \\&= a^2+iba-iab+(ib)(-ib) = a^2+b^2,\end{aligned}$$

which is always real since both a and b are real.

(b)

$$\begin{aligned}|nm| &= |(a+ib)(c+id)| \\&= |ac+iad+ibc+(-i)^2bd| \\&= |(ac-bd)+i(ad+bc)| \\&= \sqrt{(ac-bd)^2+(ad+bc)^2} \\&= \sqrt{a^2c^2+b^2d^2+a^2d^2+b^2c^2}.\end{aligned}$$

But

$$\begin{aligned}|n||m| &= |a+ib||c+id| = \sqrt{a^2+b^2}\sqrt{c^2+d^2} \\&= \sqrt{a^2c^2+b^2d^2+a^2d^2+b^2c^2},\end{aligned}$$

so $|nm| = |n||m|$.