(a) The complex conjugate $\overline{z}$ is the reflection of z about the x-axis.

(b)

$$\begin{aligned} |z|^2 &= x^2 + y^2 \\ &= x^2 - i^2 y^2 \\ &= (x + iy)(x - iy) \\ &= z\overline{z}. \end{aligned}$$

□

(c) Observe that

$$\begin{aligned} \frac{1}{z} &= \frac{1}{x + iy} \\ &= \frac{x - iy}{(x + iy)(x - iy)} \\ &= \frac{x - iy}{x^2 + y^2}. \end{aligned}$$

When z belongs to the unit circle, $x^2 + y^2 = 1$, so $1/z = x - iy = \overline{z}$. □