1. The real part of \(-2 + i\frac{(-1)^n}{n^2}\) converges to \(-2\) (it is a constant sequence), and the imaginary part converges to 0. Thus the sequence converges to \(-2 + 0i = -2\).

   Alternatively, note that, given \(\epsilon > 0\), \(|-2 + i\frac{(-1)^n}{n^2} - (-2)| = \frac{1}{n^2} < \epsilon\) when \(n > \frac{1}{\sqrt{\epsilon}}\).

6. Suppose that \(\sum_{n=1}^{\infty} z_n = S = X + iY\). If \(z_n = x_n + iy_n\), then we know by the theorem in the section that

   \[
   \sum_{n=1}^{\infty} z_n = \sum_{n=1}^{\infty} (x_n - iy_n)
   = \sum_{n=1}^{\infty} x_n - i\sum_{n=1}^{\infty} y_n
   = X - iY
   = S,
   \]

   as desired.

7. Suppose that \(\sum_{n=1}^{\infty} z_n = S = X + iY\). If \(z_n = x_n + iy_n\) and \(c = a + bi\), then we know by the theorem in the section that

   \[
   \sum_{n=1}^{\infty} cz_n = \sum_{n=1}^{\infty} (ax_n - by_n) + i(bx_n + ay_n)
   = \sum_{n=1}^{\infty} (ax_n - by_n) + i\sum_{n=1}^{\infty} (bx_n + ay_n)
   = aX - bY + i(bX + aY)
   = (a + bi)(X + iY)
   = cS,
   \]

   as desired.

8. With \(S = X + iY\), \(z_n = x_n + iy_n\), \(T = U + iV\), and \(w_n = u + iv_n\), we have

   \[
   \sum_{n=1}^{\infty} \overline{z_n} + w_n = \sum_{n=1}^{\infty} (x_n + iy_n + u_n + iv_n)
   = \sum_{n=1}^{\infty} (x_n + u_n) + i\sum_{n=1}^{\infty} (y_n + v_n)
   = X + U + i(Y + V)
   = (X + iY) + (U + iV)
   = S + T,
   \]

   as desired.