Problem 2.5 (Engel)

Show that

$$\frac{a+ib}{c+id} = \frac{ac+bd+i(bc-ad)}{c^2+d^2}$$

Solution

Strategy. $c^2 + d^2$ is the magnitude of $(c + id)$ so we will multiply the left side by

$$\frac{c-id}{c-id}$$

Execution.

$$\frac{a+ib}{c+id} * \frac{c-id}{c-id} =$$

$$= \frac{ac-iad+ibc-i^2 bd}{c^2-icd+idc-i^2 d^2}$$

$$= \frac{ac+bd+i(bc-ad)}{c^2+d^2}$$