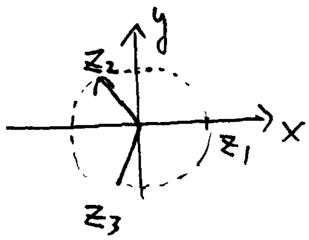
2, ii)



3. a) $(z_1+z_2)^* = [(x_1+iy_1)+(x_2+iy_2)]^* = [(x_1+x_2)+i(y_1+y_2)]^*$

$$= (x_1+x_2) - i(y_1+y_2) = (x_1-iy_1)+(x_2-iy_2) = z_1^*+z_2^*$$

b) $(z_1z_2)^* = [(x_1+iy_1)(x_2+iy_2)]^* = [(x_1x_2-y_1y_2)+i(x_1y_2+x_2y_1)]^*$

$$=(x_1x_2-y_1y_2) - i(x_1y_2+x_2y_1) = (x_1-iy_1)(x_2-iy_2) = z_1^*z_2^*$$

c) $(1/z)^* = \left(\frac{1}{x+iy}\right)^* = \left(\frac{x-iy}{x^2-y^2}\right)^* = \frac{x+iy}{x^2-y^2} = \frac{x+iy}{(x+iy)(x-iy)} = \frac{1}{x-iy} = \frac{1}{z^*}$

d) $\left(\frac{z_1}{z_2}\right)^* = \left(z_1\cdot\frac{1}{z_2}\right)^* = z_1^*\cdot\left(\frac{1}{z_2}\right)^* = z_1^*\cdot\frac{1}{z_2^*} = \frac{z_1^*}{z_2^*}$

e) $(e^z)^* = (e^{x+iy})^* = [e^x\cos y + ie^x\sin y]^* = e^x\cos y - ie^x\sin y = e^{x-iy} = e^{z^*}$

4.

a) $\ln(1) = \ln(e^{i2\pi n})$ $\quad n=0,\pm1,\pm2$

$\ln(1) = i2\pi n$

b), c). Any complex number can be expressed in polar form

$$z = re^{i\theta}$$

$\ln(z) = \ln(re^{i(\theta+2n\pi)})$ $\quad n=0,\pm1,\pm2$

$= \ln r + \ln(e^{i(\theta+2n\pi)})$

$$\boxed{\ln z = \ln r + i(\theta+2n\pi)}$$