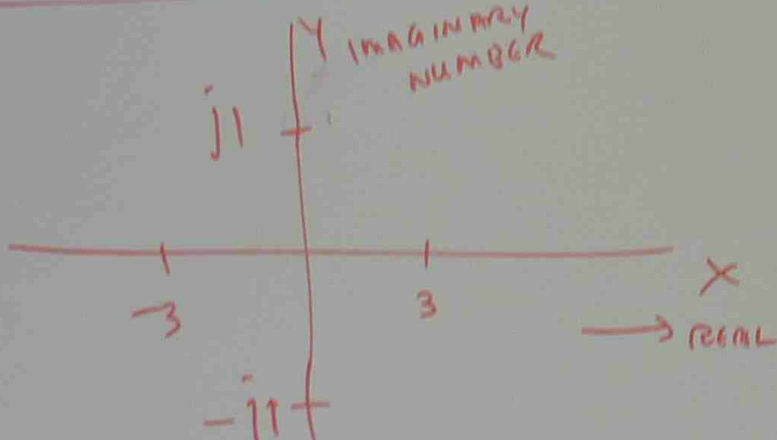
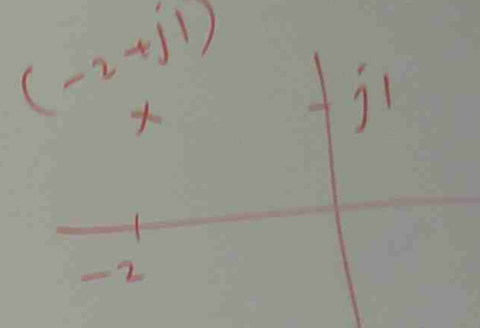
REAL & IMAGINARY NUMBER

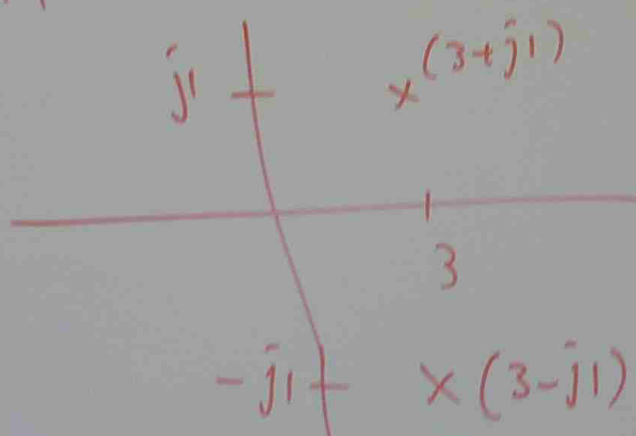
(COMPLEX NUMBER APPLICATION IN POWER ENGINEERING)

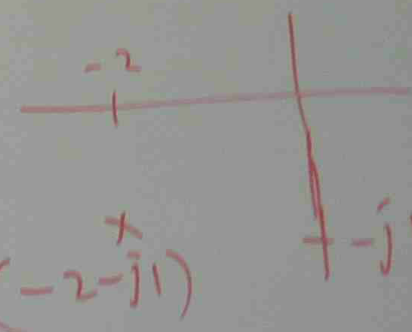




3 + j1

3 - j1





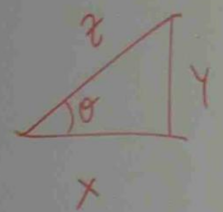
$3 + j1$ = RECTANGULAR FORM

RECTANGULAR TO POLAR CONVERSION

$Z \angle \theta$

MAGNITUDE ANGLE

I



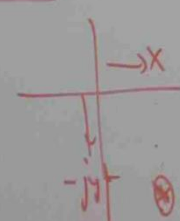
$$z = x + jy = \sqrt{x^2 + y^2} \angle \tan^{-1}\frac{y}{x}$$

RECTANGULAR FORM

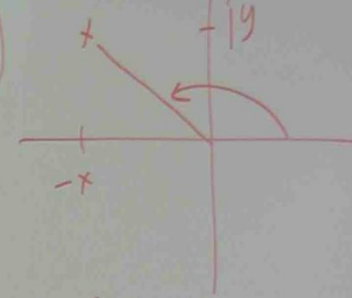
POLAR FORM

II

$$z = x - jy = \sqrt{x^2 + y^2} \angle -\tan^{-1}\frac{y}{x}$$



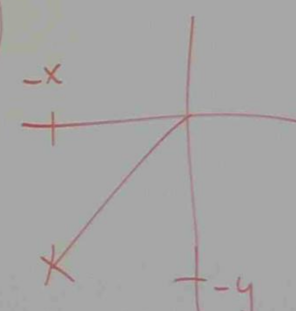
III



$z = -x + jy$

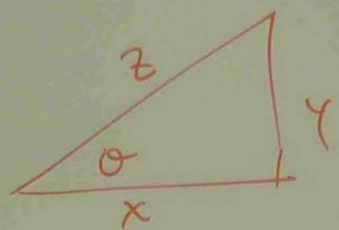
$$z = -x + jy = \sqrt{x^2 + y^2} \angle 180 - \tan^{-1}\frac{y}{x}$$

IV

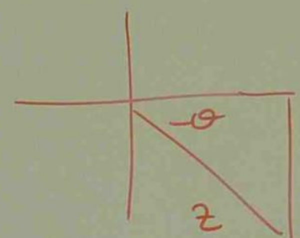


$$z = -x - jy = \sqrt{x^2 + y^2} \angle -\left(180 - \tan^{-1}\frac{y}{x}\right)$$

POLAR TO RECTANGULAR CONVERSION



$$z\angle\theta \rightarrow z\cos\theta + j\,z\sin\theta$$



$$z\angle{-\theta} \Rightarrow = z\cos(-\theta) + j\,z\sin(-\theta)$$

$$= z\cos\theta - j\,z\sin\theta$$

$$j = \sqrt{-1}$$

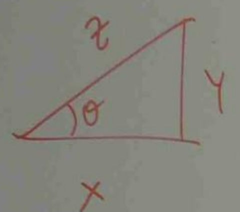
$3 + j1$ = RECTANGULAR FORM

RECTANGULAR TO POLAR CONVERSION

$Z \angle \theta$

MAGNITUDE ANGLE

I



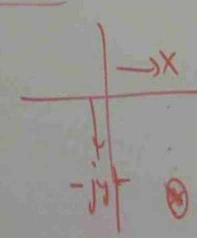
$$z = x + jy = \sqrt{x^2+y^2} \angle \tan^{-1}\frac{y}{x}$$

RECTANGULAR FORM

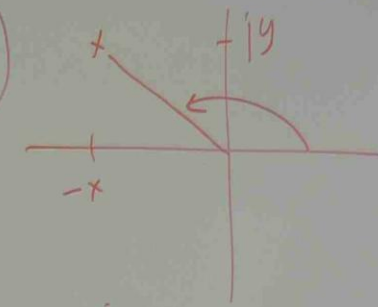
POLAR FORM

II

$$z = x - jy = \sqrt{x^2+y^2} \angle -\tan^{-1}\frac{y}{x}$$



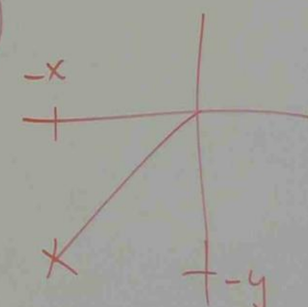
III



$z = -x + jy$

$$z = -x + jy = \sqrt{x^2+y^2} \angle 180 - \tan^{-1}\frac{y}{x}$$

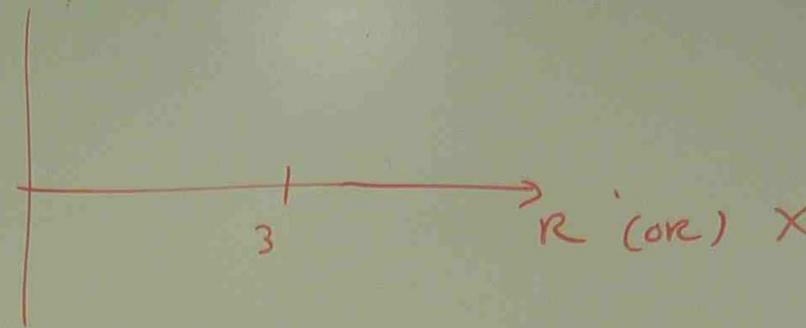
IV



$$z = -x - jy = \sqrt{x^2+y^2} \angle -\left(180 - \tan^{-1}\frac{y}{x}\right)$$

3Ω

RESISTOR



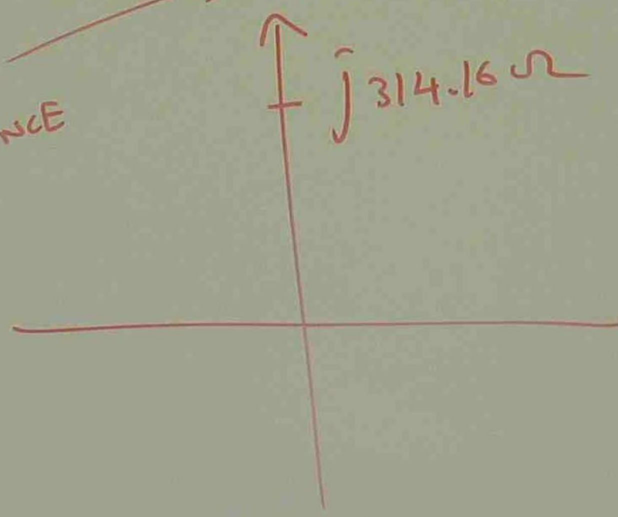
1 HENRY ← INDUCTANCE

INDUCTOR

$X_L = 2\pi f L = 2 \times 3.1416 \times 50 \times 1 = 314.16$

$f = 50\,Hz$

INDUCTIVE REACTANCE → +Y (OR) INDUCTOR



(OR)

j314.16 Ω

CAPACITOR

1 μF ← CAPACITANCE

$$X_C = \frac{1}{2\pi f C}$$

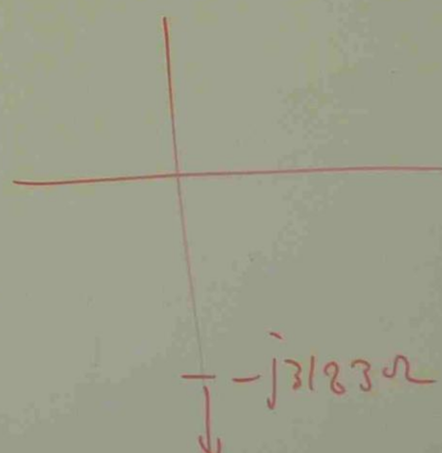
CAPACITIVE REACTANCE

$$= \frac{1}{2 \times 3.1416 \times 50 \times 1 \times 10^{-6}}$$

$$= \frac{10^6}{314.16}$$

$$= 3183$$

$$-j3183\,\Omega$$



-Y (OR) CAPACTIVE REACTANCE

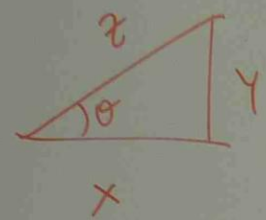
$3 + j1$ = RECTANGULAR FORM

RECTANGULAR TO POLAR CONVERSION

$Z \angle \theta$

MAGNITUDE ANGLE

I



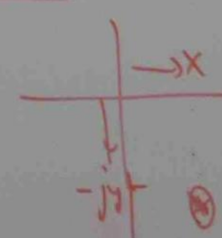
$$z = x + jy = \sqrt{x^2 + y^2} \angle \tan^{-1}\frac{y}{x}$$

RECTANGULAR FORM

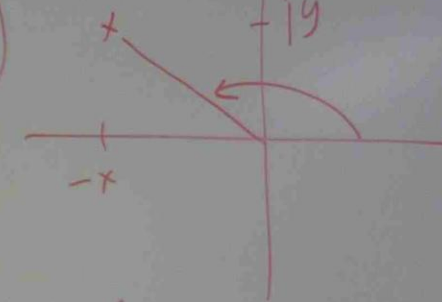
POLAR FORM

II

$$z = x - jy = \sqrt{x^2 + y^2} \angle -\tan^{-1}\frac{y}{x}$$



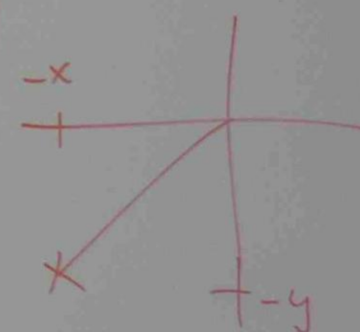
III



$z = -x + jy$

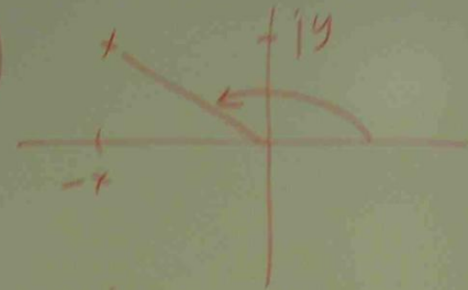
$$z = -x + jy = \sqrt{x^2 + y^2}$$

IV



$$z = -x - jy = \sqrt{x^2 +$$

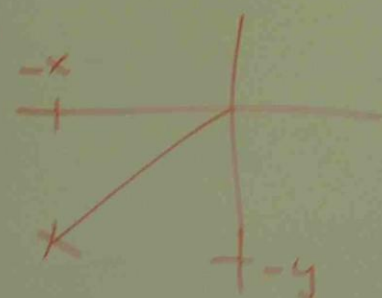
III



$z = -x + jy$

$$z = -x + jy = \sqrt{x^2 + y^2} \angle 180 - \tan^{-1}\frac{y}{x}$$

IV



$$z = -x - jy = \sqrt{x^2 + y^2} \angle -\left(180 - \tan^{-1}\frac{y}{x}\right)$$

pb ①

CONVERT THE FOLLOWINGS TO POLAR FORM

(a) $3+j4$ (b) $-3+j4$ (c) $3-j4$ (d) $-3-j4$

pb ②

CONVERT THE FOLLOWINGS TO RECTANGULAR FORM

(a) $5\angle 36.8^\circ$, (b) $5\angle -36.8^\circ$, (c) $5\angle -120^\circ$, (d) $5\angle -250^\circ$

pb ①

$$3+j4 = \sqrt{3^2+4^2}\ \angle \tan^{-1}\frac{4}{3} = 5\angle 53.2^\circ\ \Omega$$

$$-3+j4 = \sqrt{3^2+4^2}\ \angle 180-\tan^{-1}4/3 = 5\angle 180-53.1 = 5\angle 126.8^\circ\ \Omega$$

$$3-j4 = \sqrt{3^2+4^2}\ \angle -\tan^{-1}4/3 = 5\angle -53.1^\circ\ \Omega$$

$$-3-j4 = \sqrt{3^2+4^2}\ \angle -(180-\tan^{-1}4/3) = 5\angle -126.8^\circ\ \Omega$$

E REACTANCE