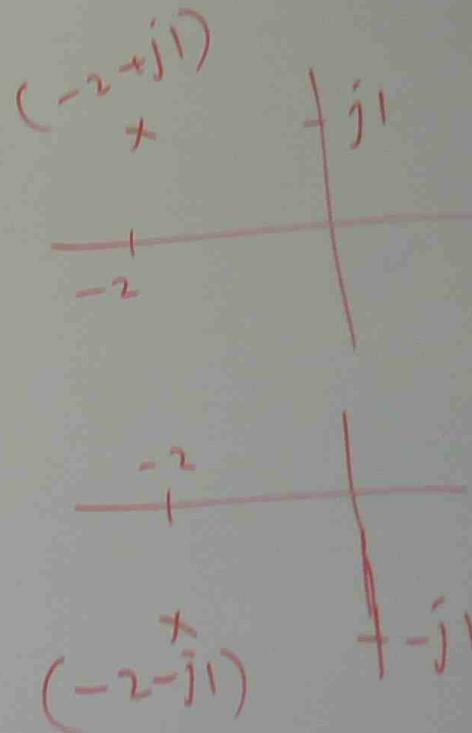
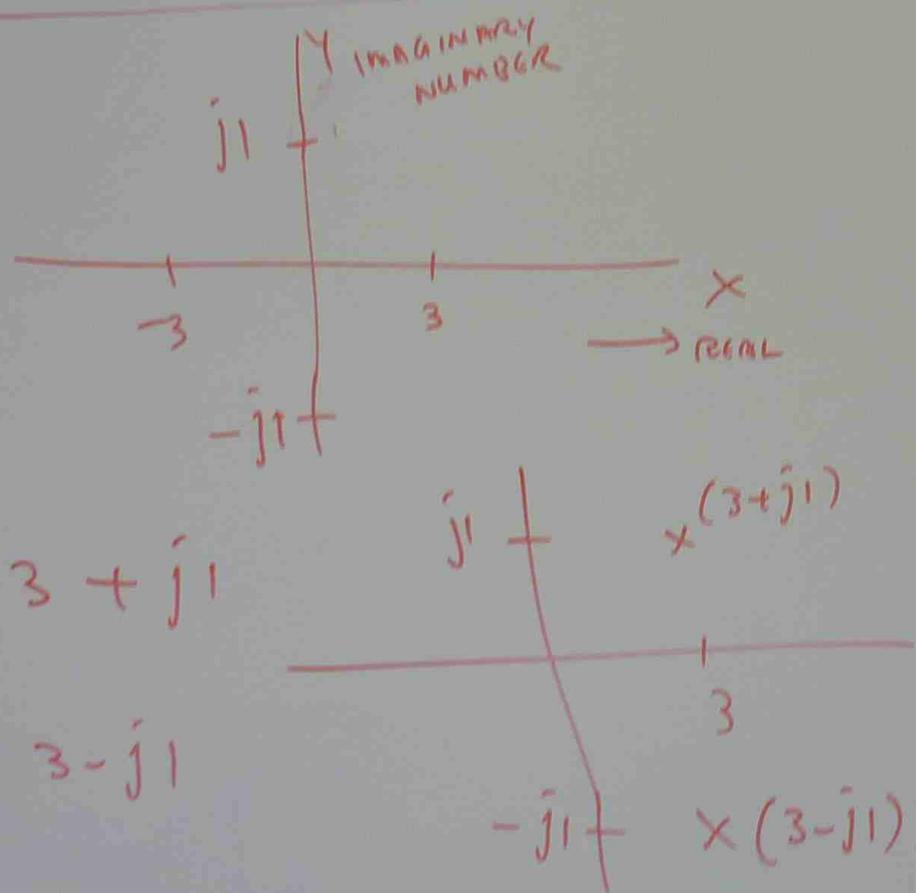


## REAL & IMAGINARY NUMBER

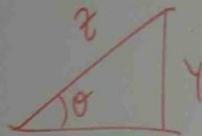
(COMPLEX NUMBER APPLICATION IN POWER ENGINEERING)



$$3+j1 = \text{RECTANGULAR FORM}$$

RECTANGULAR TO POLAR CONVERSION

(I)



$z \angle \theta$   
MAGNITUDE ANGLE

$$z = x + jy = \sqrt{x^2 + y^2} \left[ \tan^{-1} \frac{y}{x} \right]$$

↑                              ↑

RECTANGULAR  
form                            POLAR form

(II)

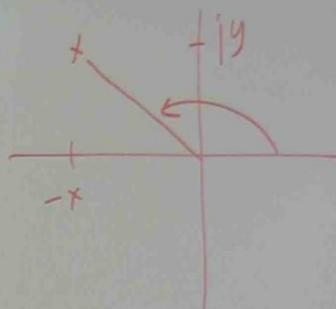
$$z = x - jy = \sqrt{x^2 + y^2} \left[ -\tan^{-1} \frac{y}{x} \right]$$

↓

$\rightarrow x$

$-jy$        $\odot$

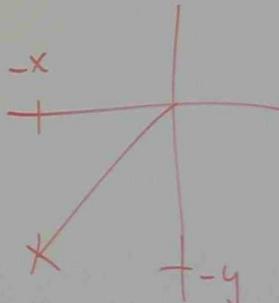
(III)



$$z = -x + jy$$

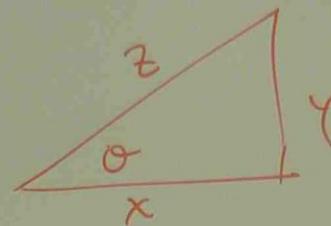
$$z = -x + jy = \sqrt{x^2 + y^2} \left[ 180 - \tan^{-1} \frac{y}{x} \right]$$

(IV)

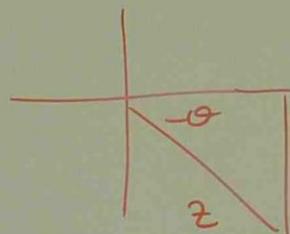


$$z = -x - jy = \sqrt{x^2 + y^2} \left[ -(180 - \tan^{-1} \frac{y}{x}) \right]$$

## POLAR TO RECTANGULAR CONVERSION



$$z[\theta] \rightarrow z \cos\theta + j z \sin\theta$$



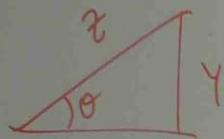
$$\begin{aligned} z[-\theta] &= z \cos(-\theta) + j z \sin(-\theta), \\ &= z \cos\theta - j z \sin\theta \end{aligned}$$

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

$3+j1$  = RECTANGULAR FORM

RECTANGULAR TO POLAR CONVERSION

(I)



$z \angle \theta$   
MAGNITUDE ANGLE

$$z = x + jy = \sqrt{x^2 + y^2} \left[ \tan^{-1} \frac{y}{x} \right]$$

↑                              ↑  
RECTANGULAR FORM          POLAR FORM

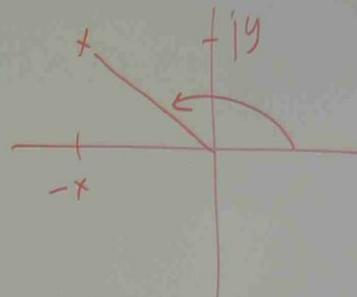
(II)

$$z = x - jy = \sqrt{x^2 + y^2} \left[ -\tan^{-1} \frac{y}{x} \right]$$

↓  
-jy

A diagram showing a right-angled triangle in the fourth quadrant of a Cartesian coordinate system. The horizontal leg is labeled 'x' and the vertical leg is labeled '-y'. The hypotenuse is labeled 'z' and the angle between the positive x-axis and the hypotenuse is labeled ' $\theta$ '.

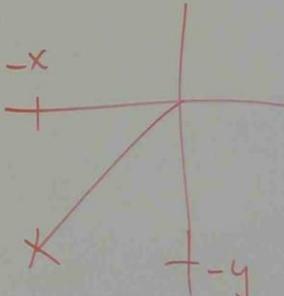
(III)



$$z = -x + jy$$

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

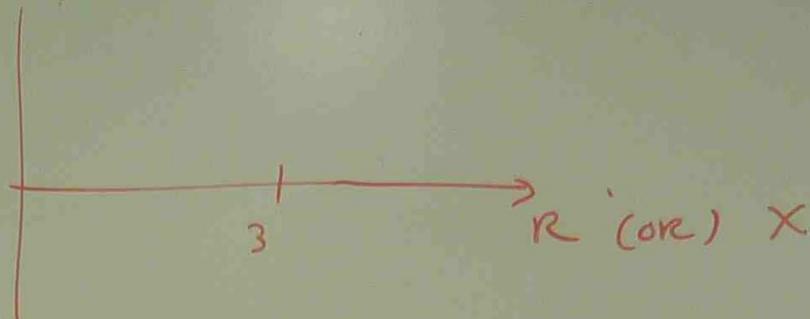
(IV)



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

$3\Omega$

RESISTOR



$1 \text{ HENRY}$  ← INDUCTANCE

INDUCTOR

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

$f = 50 \text{ Hz}$

INDUCTIVE  
REACTANCE

$\rightarrow j$  (or) INDUCTOR

$j 314.16 \Omega$

(or)

$j 314.16 \Omega$

CAPACITOR

1 μF

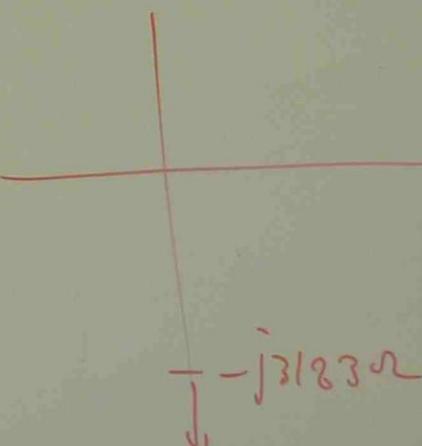


CAPACITANCE

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

CAPACITIVE  
REACTANCE

$$= \frac{1}{2 \times 3.1416 \times 50 \times 1 \times 10^{-6}}$$
$$= \frac{10^6}{314.16}$$
$$= 3183$$
$$-j3183 \Omega$$

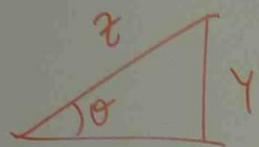


-j3183 Ω  
-Y (or) CAPACITIVE REACTANCE

$$3+j1 = \text{RECTANGULAR FORM}$$

RECTANGULAR TO POLAR CONVERSION

(I)



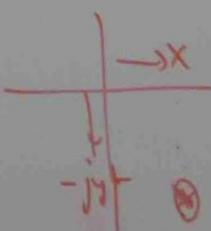
$z \angle \theta$   
MAGNITUDE ANGLE

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

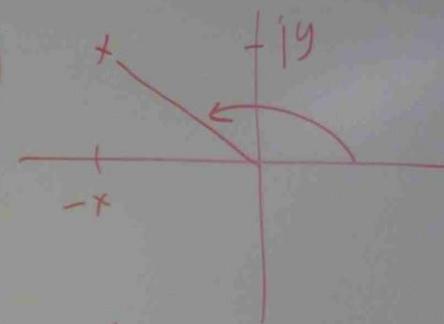
↑                              ↑  
RECTANGULAR FORM          POLAR FORM

(II)

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

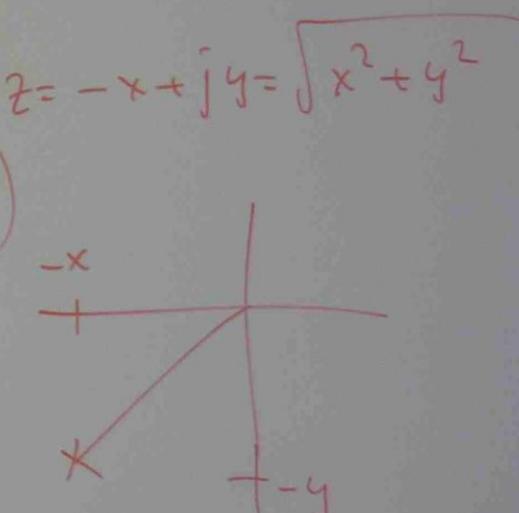


(III)



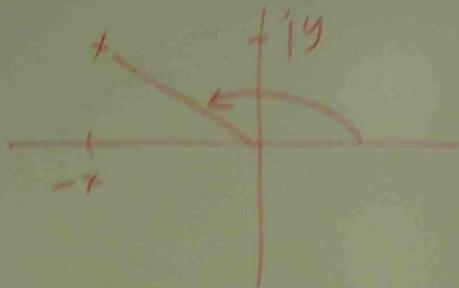
$$z = -x + jy$$

(IV)



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

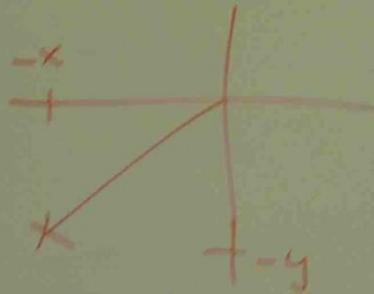
(III)



$$z = -x + iy$$

$$z = -x + iy = \sqrt{x^2 + y^2} \quad \boxed{180^\circ - \tan^{-1} \frac{y}{x}}$$

(IV)



$$z = -x - iy = \sqrt{x^2 + y^2} \quad \boxed{-(180^\circ - \tan^{-1} \frac{y}{x})}$$

Pb ①

CONVERT THE FOLLOWINGS TO POLARIC 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

$$3+j4 = \sqrt{3^2+4^2} \left[ \tan^{-1} \frac{4}{3} \right] = 5 \angle 53.1^\circ$$

$$-3+j4 = \sqrt{3^2+4^2} \left[ 180 - \tan^{-1} \frac{4}{3} \right] = 5 \angle 126.8^\circ$$

$$3-j4 = \sqrt{3^2+4^2} \left[ -\tan^{-1} \frac{4}{3} \right] = 5 \angle -53.1^\circ$$

$$-3-j4 = \sqrt{3^2+4^2} \left[ -(180 - \tan^{-1} \frac{4}{3}) \right] = 5 \angle -126.8^\circ$$

C REACTANCE

