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Complex Number

$z = x + iy$ where $x, y \in \mathbb{R}$.

iota $i = \sqrt{-1}$

$Re(z) = x$

$Im(z) = y$

$2 + 3i$

$-2i$

$z = 0$ is purely real or purely imaginary

- If $y = 0 \Rightarrow z$ is purely real.
- If $x = 0, \Rightarrow z$ is purely imaginary
- If $y \neq 0 \Rightarrow z$ is imaginary number.

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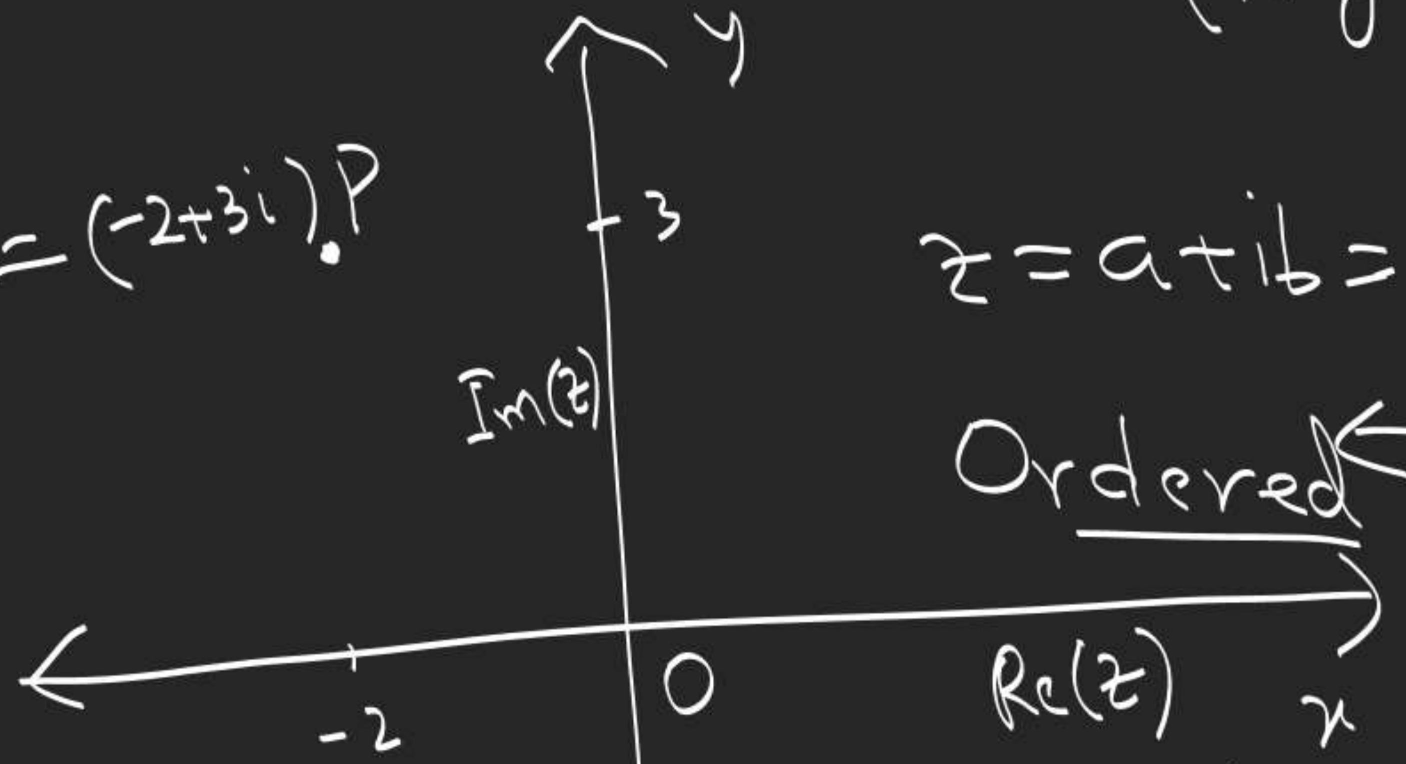
Representation of Complex Number

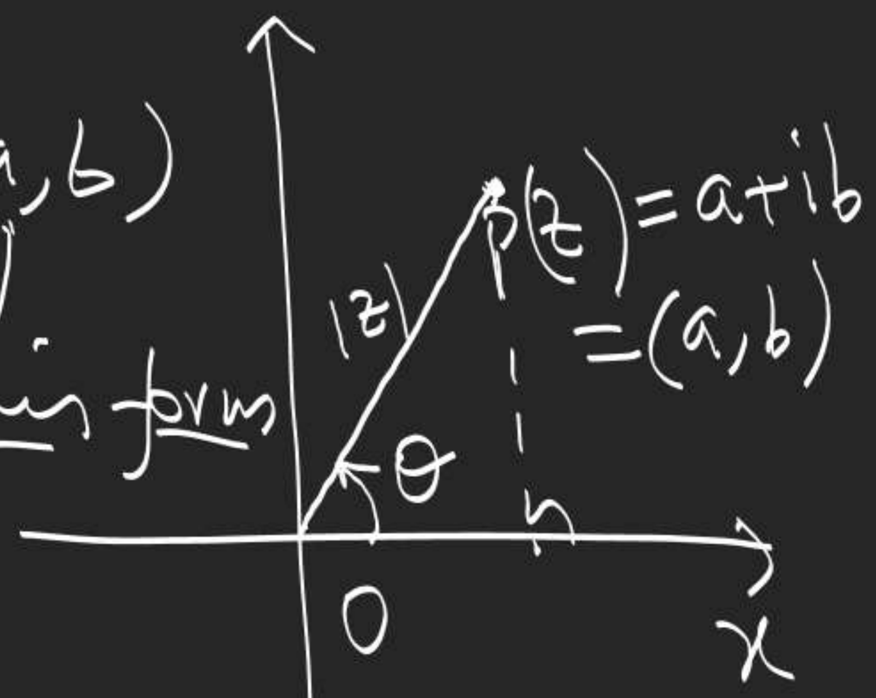
(Argand Plane / Complex plane)

$(-2,3) = (-2+3i)$ P



$z = a+ib = (a,b)$

Ordered pair form



θ = argument of z = $\arg(z)$

$\tan\theta = \frac{b}{a}$

$z = -2+3i$

$|z|$ = Modulus / Magnitude of z

$|z|$ is non negative real number $\Leftarrow |z| = \sqrt{a^2+b^2}$.

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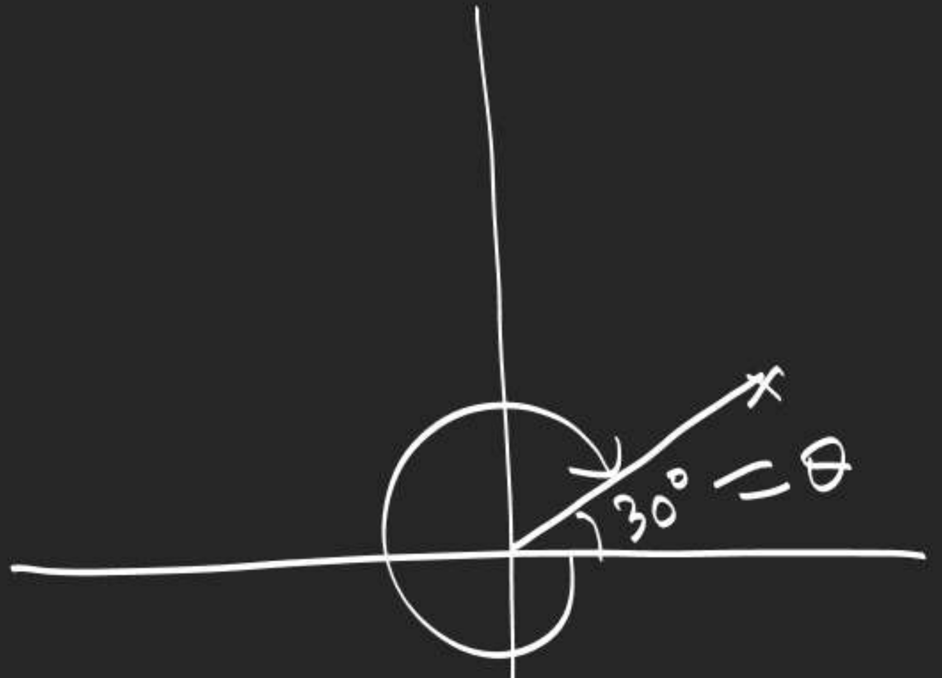
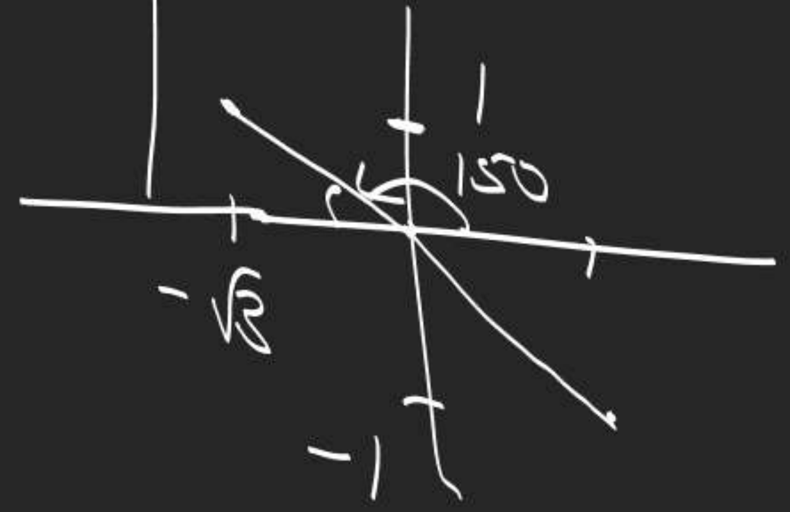


$\theta = -330°$



Principle argument of
Complex number

$$\theta \in (-\pi, \pi]$$

principle arg. of

(1) $z = 1 - i$ $\quad \theta = -\frac{\pi}{4}$

(2) $z = -\sqrt{3} + i$ $\quad \theta = \frac{5\pi}{6}$

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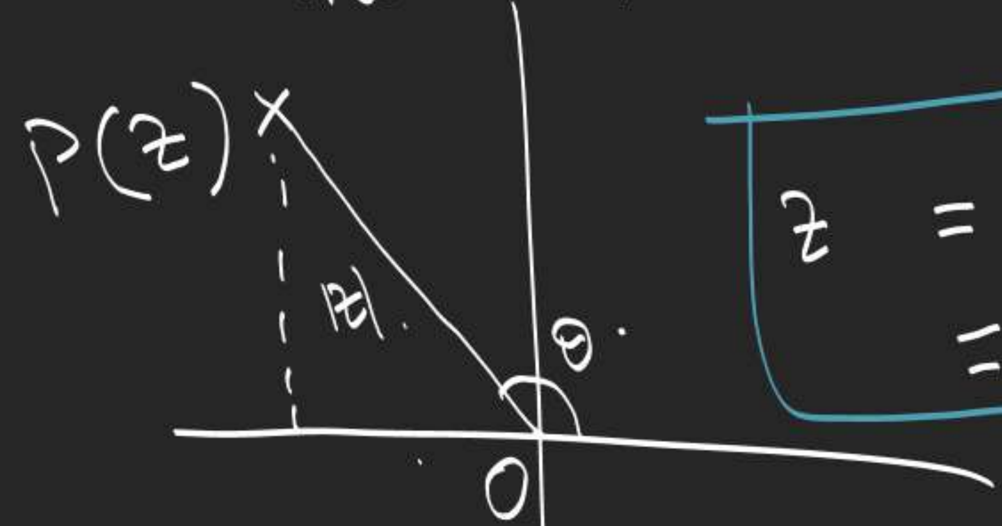
Note → ① $\boxed{z = \vec{OP}}$ ✓

② $z = 0$ has modulus '0' and argument not defined.



$$\boxed{\begin{aligned} z &= |z|(\cos\theta + i\sin\theta) = |z|e^{i\theta} \\ &= |z|\,\mathrm{cis}\,\theta \end{aligned}}$$

Trigonometric form

$$z = |z|\cos\theta + i|z|\sin\theta$$

$$\boxed{z = |z|(\cos\theta + i\sin\theta)}$$

Euler's form

$$(|z|, \theta) = \left(2, \frac{\pi}{3}\right)$$

$$\begin{aligned} z &= 2\cos\frac{\pi}{3} + i\,2\sin\frac{\pi}{3} \\ &= 1 + i\sqrt{3}. \end{aligned}$$

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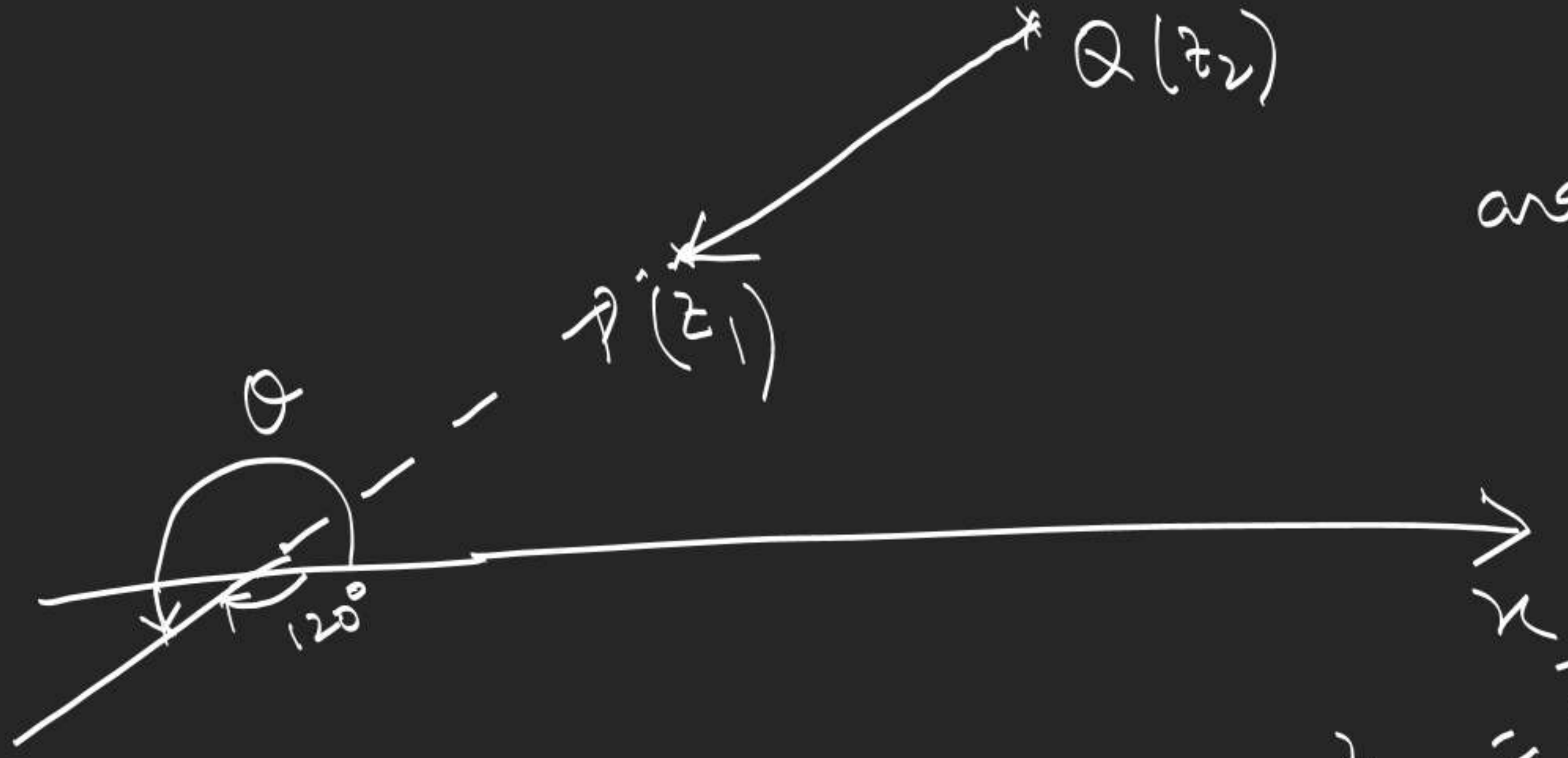

$\arg(z_1 - z_2) = ?$

$|z_1 - z_2| = ?$

$z_1 - z_2 = \overrightarrow{QP}$

$|\overrightarrow{PQ}| = |z_1 - z_2|$

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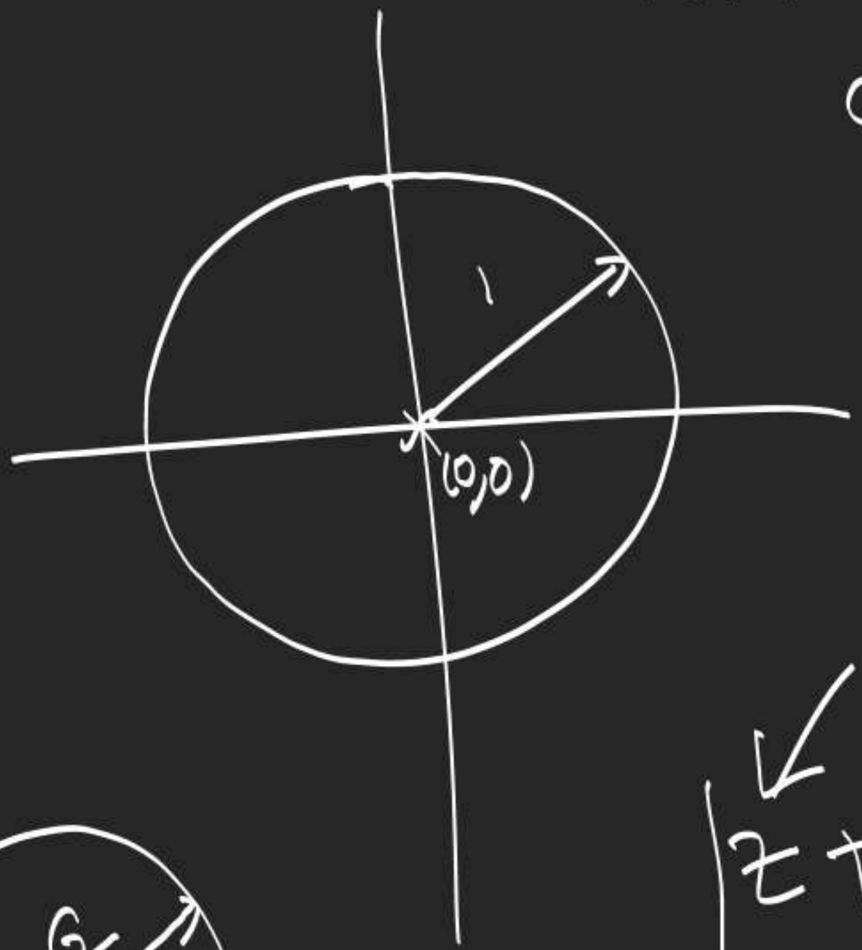
Represent 'z' in Argand plane

Satisfying $|z| = 1$

lies on circle with centre $(0,0)$ and radius 1.



$z = x+iy$

$$|z+1-i| = \sqrt{2}$$

$$|z-(-1+i)| = \sqrt{2}$$

$$|(x+1)+i(y-1)| = \sqrt{2}$$

$$\boxed{(x+1)^2+(y-1)^2 = 2}$$

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$$|z+2-i| = -5$$

$$\phi$$

$$-2 \leq |z+3-i| < 7$$

$$|z-1| \geq 5$$

outside or on the circle

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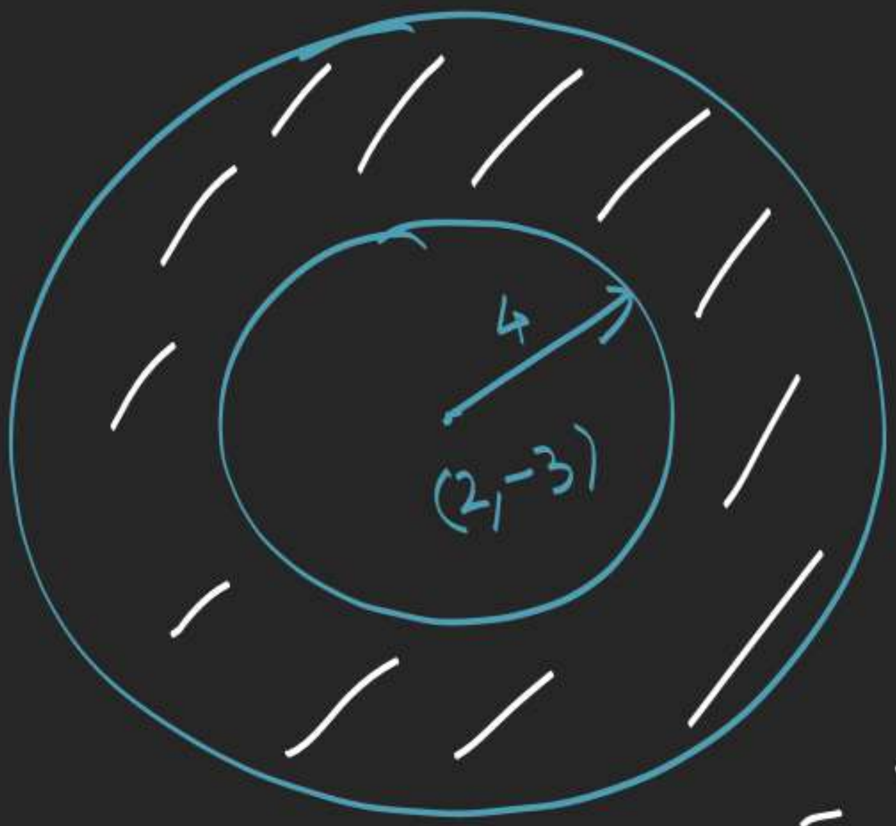
$$4 < |z - 2 + 3i| \le 7$$



Find area of region formed by 'z' satisfying

Area $= \pi\left(7^2 - 4^2\right)$

Ex-2 (remaining)

leave 14, $\boxed{18}$

Ex-3 (1-11)