The Argand Diagram

Complex numbers can be represented geometrically on an **Argand Diagram.**

$A = 2$

$B = -3i$

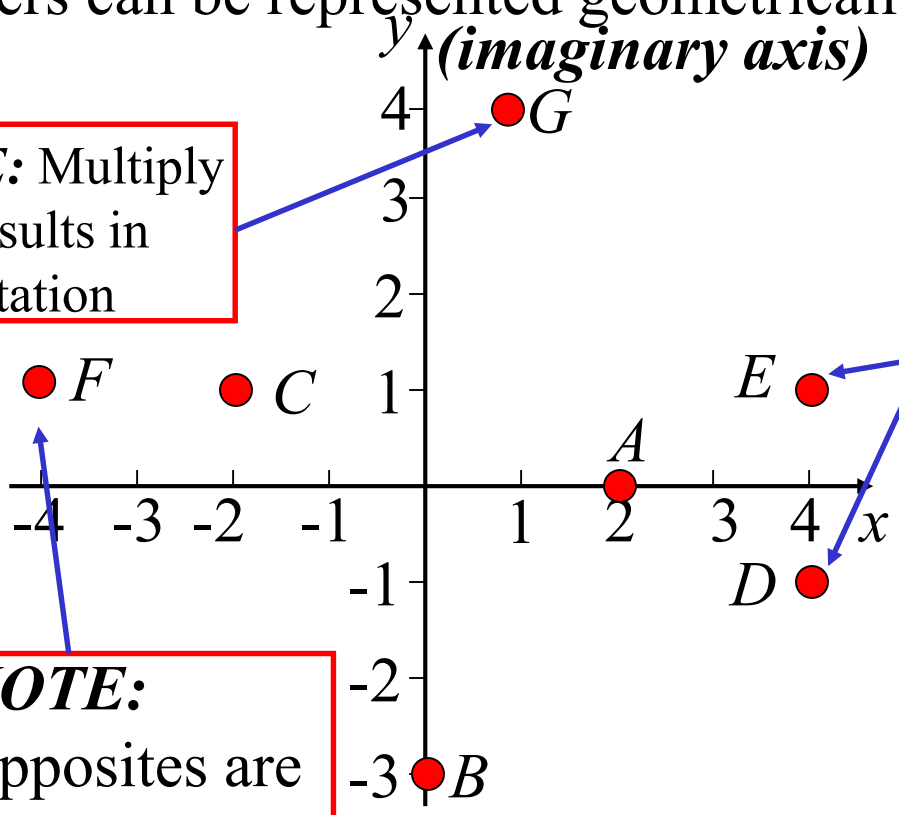
$C = -2 + i$

$D = 4 - i$

$E = 4 + i$

$F = -(4 - i)$
$= -4 + i$

$G = i(4 - i)$
$= 1+4i$



NOTE: Multiply by i results in 90° rotation

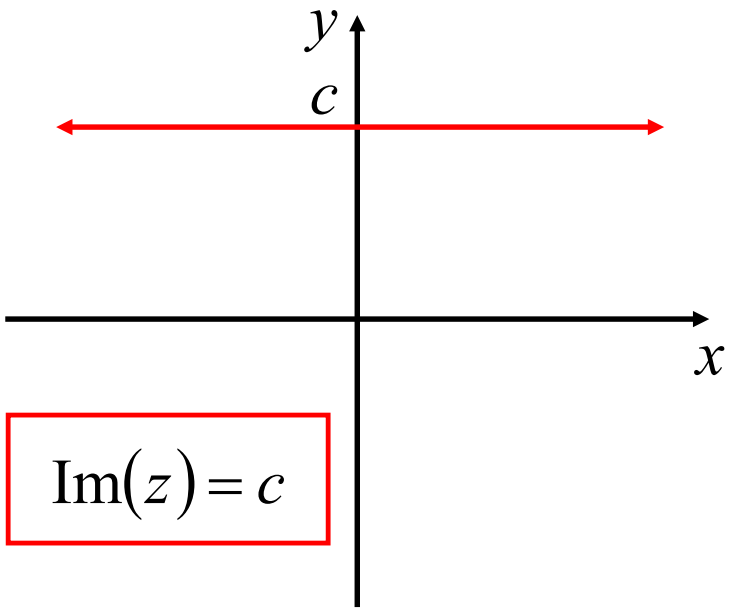
NOTE: Conjugates are reflected in the real (x) axis

NOTE:
Opposites are rotated 180°
i.e. reflected through the origin

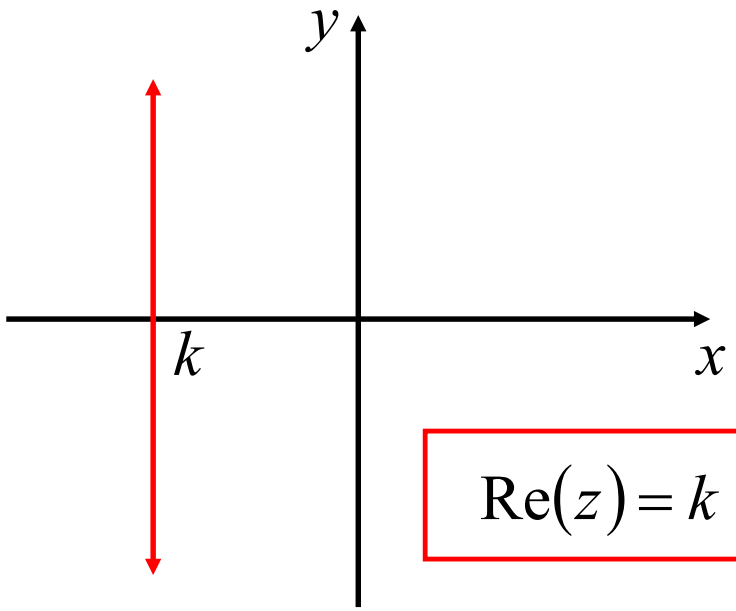
Every complex number can be represented by a unique point on the Argand Diagram.

Locus in Terms of Complex Numbers

Horizontal and Vertical Lines



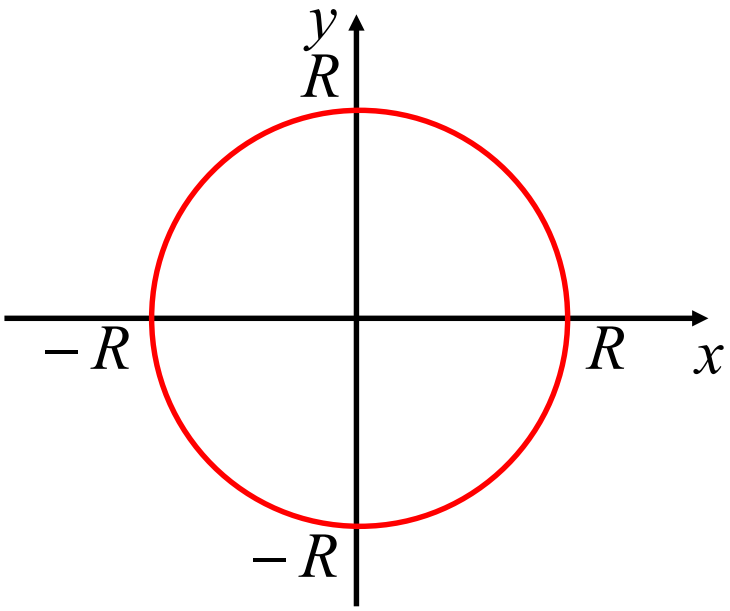
$\mathrm{Im}(z) = c$



$\mathrm{Re}(z) = k$

Circles

$z\bar{z} = R^2$



$(z-\omega)(\bar{z}-\bar{\omega}) = R^2$

Locus is a circle

centre ω

radius R

e.g.Find and describe the locus of points in the Argand diagram;

(i) $(z+4+i)(\bar{z}+4-i) = 49$

$z\bar{z} + (4+i)\bar{z} + (4-i)z + (4+i)(4-i) = 49$

$z\bar{z} + 4(z+\bar{z}) + i\bar{z} - iz + (4+i)(4-i) = 49$

$z\bar{z} + 4(z+\bar{z}) - \overline{iz} - iz + (4+i)(4-i) = 49$

$z\bar{z} + 4(z+\bar{z}) - (\overline{iz} + iz) + (4+i)(4-i) = 49$

$x^2 + y^2 + 8x + 2y + 16 + 1 = 49$

$x^2 + 8x + 16 + y^2 + 2y + 1 = 49$

$(x+4)^2 + (y+1)^2 = 49$

Locus is a circle

centre : $(-4,-1)$

radius : 7 units

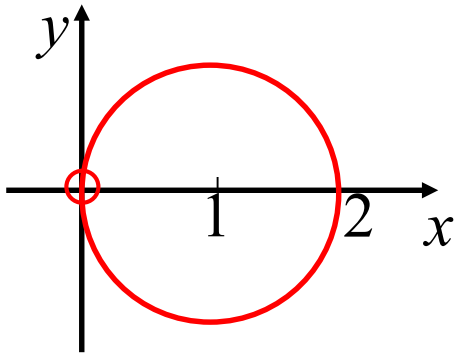
$(ii)\ \dfrac{1}{\bar{z}}+\dfrac{1}{z}=1$

$z+z=z\bar{z}$

$2x=x^2+y^2$

$x^2-2x+y^2=0$

$(x-1)^2+y^2=1$



Locus is a circle

centre: $(1,0)$

radius: 1 unit

excluding the point (0,0)

Exercise 1C; 1 ace, 2 bd, 3, 4 ace, 5 bdfh, 6, 10 to 15