



Conformal mapping

A mapping $w = f(z)$ is said to be conformal at $z = z_0$ if $f'(z_0) \neq 0$.

The point at which the mapping $w = f(z)$ is not conformal.

i.e., $f'(z) = 0$ is called a critical point of the mapping.

If the transformation $w = f(z)$ is conformal at a point, the inverse transformation $z = f^{-1}(w)$ is also conformal at the corresponding point.

Some standard transformations:

1. Translation:

The transformation $w = c + z$, where c is a complex constant, represents a translation.

$$\text{Let } z = x + iy$$

$$w = u + iv$$

$$c = a + ib$$

$$\text{Given } w = z + c$$

$$u + iv = x + iy + a + ib$$

$$u + iv = (x + a) + i(y + b)$$

Equating the real and imaginary parts, we get

$$u = x + a, \quad v = y + b$$



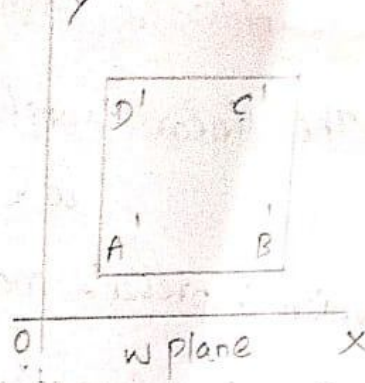
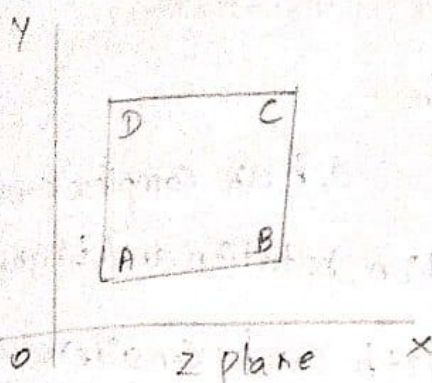
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2. Magnification:

The transformation $w = cz$, where c is a real constant, represents magnification.

$$u + iv = c(x + iy)$$

$$u + iv = (cx + icy)$$

$$u = cx, v = cy$$

The image of the Point (x, y) is the Point (cx, cy) .

X Magnification and Rotation:

The transformation $w = cz$, where c is a complex constant represents both magnification and rotation.

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

$$w = Re^{i\phi} \quad \text{and} \quad c = ae^{i\alpha}$$

$$Re^{i\phi} = (ae^{i\alpha})(re^{i\theta}) = are^{i(\theta+\alpha)}$$

The transformation equations are $R = ar$, $\phi = \theta + \alpha$.

The point (r, θ) in z -plane is mapped on to the Point $(ar, \theta + \alpha)$.