Step-1

To find all solutions to the equation $e^{ix} = -1$, and all solutions to the equation $e^{i\theta} = i$

It is known that;

$e^{i\theta} = \cos\theta + i\sin\theta$

Where, θ is arbitrary angle;

$\cos\theta = -1$ For $\theta = (2k+1)\pi$

$\sin\theta = 1$ For $\theta = (2k+1)\frac{\pi}{2}$, where k is even that is $k = 0,2,4,...$

Step-2

Now, consider the equation $e^{ix} = -1$

This implies;

$e^{ix} = \cos(2k+1)\pi + i\sin(2k+1)\pi$ for $k = 0,1,2,\ldots$
$e^{ix} = e^{i(2k+1)\pi}$ for $k = 0,1,2,\ldots$
$ix = i(2k+1)\pi$ or $k = 0,1,2,\ldots$

This implies;

$\boxed{x = (2k+1)\pi \text{ for } k = 0,1,2,...}$

Step-3

Now, consider another equation $e^{i\theta} = i$

This implies;

$e^{i\theta} = 0 + 1i$
$e^{i\theta} = \cos(2k+1)\frac{\pi}{2} + i\sin(2k+1)\frac{\pi}{2}$ for $k = 0,2,4,...$
$e^{i\theta} = e^{i(2k+1)\frac{\pi}{2}}$ for $k = 0,2,4,...$
$i\theta = i(2k+1)\frac{\pi}{2}$ or $k = 0,2,4,...$

This implies;

$$\boxed{\theta = (2k+1)\frac{\pi}{2} \text{ for } k = 0, 2, 4, \ldots}$$