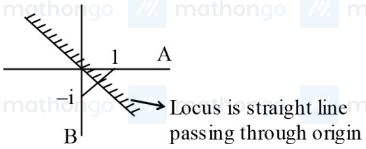
ANSWER KEYS

1. (3)	**2.** (4)	**3.** (4)	**4.** (1)	**5.** (12.56)	**6.** (1)	**7.** (3)	**8.** (1)
9. (2)	**10.** (2)						

1. (3)



Let P be point satisfying complex number

$\Rightarrow\ |z-1|=|z+i|$

$\Rightarrow\ |z-1|=|z-(-i)|$

from given figure it is clear that distance of point P from points on co-ordinate axes are same.

$\Rightarrow \boxed{PA=PB}$

so it is possible only when point P lies on line passes through origin .

2. (4)

Let $z=x+iy$

$\left(\frac{z-1}{2z+i}\right)=\frac{(x-1)+iy}{2(x+iy)+i}=\frac{(x-1)+iy}{2x+(2y+1)i}\times\frac{2x-(2y+1)i}{2x-(2y+1)i}$

$Re\left(\frac{z+1}{2z+i}\right)=\frac{2x(x-1)+y(2x+1)}{(2x^2)+(2y+1)^2}=1$

$\Rightarrow 2x^2+2y^2-2x+y=4x^2+4y^2+4y+1$

$\Rightarrow 2x^2+2y^2+2x+3y+1=0$

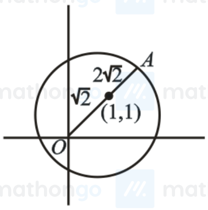
$\Rightarrow x^2+y^2+x+\frac{3}{2}y+\frac{1}{2}=0$

Circle with center $\left(-\frac{1}{2},\ -\frac{3}{4}\right)$

$r=\sqrt{\frac{1}{4}+\frac{9}{16}-\frac{1}{2}}=\sqrt{\frac{4+9-8}{16}}=\frac{\sqrt{5}}{4}\Rightarrow d=\frac{\sqrt{5}}{2}$

where, d =diameter of the given circle.

3. (4)



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

$|z|_{max}=OA=3\sqrt{2}$

$[|z|]=4$

4. (1)

$\left|\frac{z-5i}{z+5i}\right|=1$

$\Rightarrow |z-5i|^2=|z+5i|^2$

$\Rightarrow x^2+(y-5)^2=x^2+(y+5)^2$

$\Rightarrow y=0$

Hence, z lies on $x-$ axis.

5. (12.56)

$\operatorname{Im}\left(\frac{-\bar{z}}{|z|^2}\right) = \frac{1}{4}$

Let, $z = x + iy$, then

$\bar{z} = x - iy$

$\Rightarrow -\frac{(-y)}{x^2+y^2} = \frac{1}{4} \Rightarrow x^2 + y^2 - 4y = 0$

Hence, locus is a circle

$\Rightarrow$ radius of circle is 2

$\Rightarrow$ perimeter of circle is 4π

6. (1)

Given $|z - 3 - i| = |z - 9 - i| \quad \ldots(1)$

put $z = x + iy$

$\Rightarrow |x + iy - 3 - i| = |x + iy - 9 - i|$

$\Rightarrow (x-3)^2 + (y-1)^2 = (x-9)^2 + (y-1)^2$

$\Rightarrow x - 3 = \pm(x - 9)$

$\Rightarrow x = 6 \ldots(2)$

Also given,

$|z - 3 + 3i| = 3 \quad \ldots(3)$

$\Rightarrow |x + \text{iy} - 3 + 3\text{i}| = 3$

$\Rightarrow (x-3)^2 + (y+3)^2 = 9 \quad \ldots(4)$

Using equation (2) & (4), we get unique value of x and y

$x = 6, \; y = -3$

7. (3)

$f(z) = z \;\&\; f(z) = i\bar{z} \;\Rightarrow\; z = i\bar{z}$

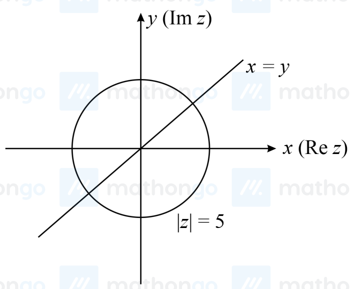
$x + iy = i(x - iy)$

$x + iy = ix + y$

$\Rightarrow x = y$

and $|z| = 5 \Rightarrow x^2 + y^2 = 25$

Plotting both



Hence, two values are satisfying.

8. **(1)** Let $z=x+iy$

$\therefore \quad |z-1|=|z-2|=|z-i|$

$\Rightarrow |(x-1)+iy|=|(x-2)+iy|$

$=|x+i(y-1)| \qquad$ [put $z=x+iy$]

$\Rightarrow x^2-2x+1+y^2=x^2+4-4x+y^2=x^2+y^2+1-2y$

Taking Ist and IInd terms

$-2x+1=4-4x \quad \Rightarrow \quad 2x=3$ ...(i)

Taking IInd and IIIrd terms

$4-4x=1-2y \quad \Rightarrow \quad 4x-2y=3$ ...(ii)

Taking Ist and IIIrd terms

$-2x+1=1-2y \quad \Rightarrow \quad x=y$ ...(iii)

From Eq. (i), $x=\frac{3}{2}$

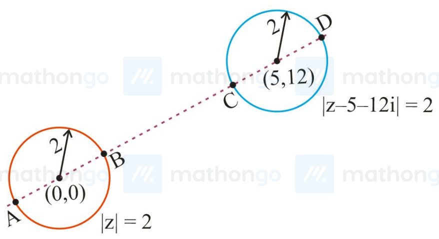
From Eqs. (i) and (iii), $y=\frac{3}{2}$

On putting the value of x and y in Eq. (ii), we get

$4\left(\frac{3}{2}\right)-2\left(\frac{3}{2}\right)=3 \quad \Rightarrow \quad 3=3$

$\therefore$ One solution exists.

9. **(2)**



$\lambda=|AD|=2+\sqrt{(5-0)^2+(12-0)^2}+2=17$

$\mu=|BC|=\sqrt{(5-0)^2+(12-0)^2}-2-2=9$

Now $\lambda^2+\mu^2=370$

10. **(2)** $|Z - Z_1| + |Z - Z_2| = 2a$

When $|Z_1 - Z_2| \leq 2a$, then it is an ellipse

$Z_1 = 2 + 3i$ and $Z_2 = -2 + 6i$

$Z_1 - Z_2 = (2 + 3i) - (-2 + 6i) = 4 - 3i$

$|Z_1 - Z_2| = |4 - 3i|$

$\sqrt{4^2 + (-3)^2} = 5$

But $5 < 4$ is false, because in any triangle sum of two sides is not smaller than third side.

$\therefore$ $P(z)$ is not representing locus of any point.