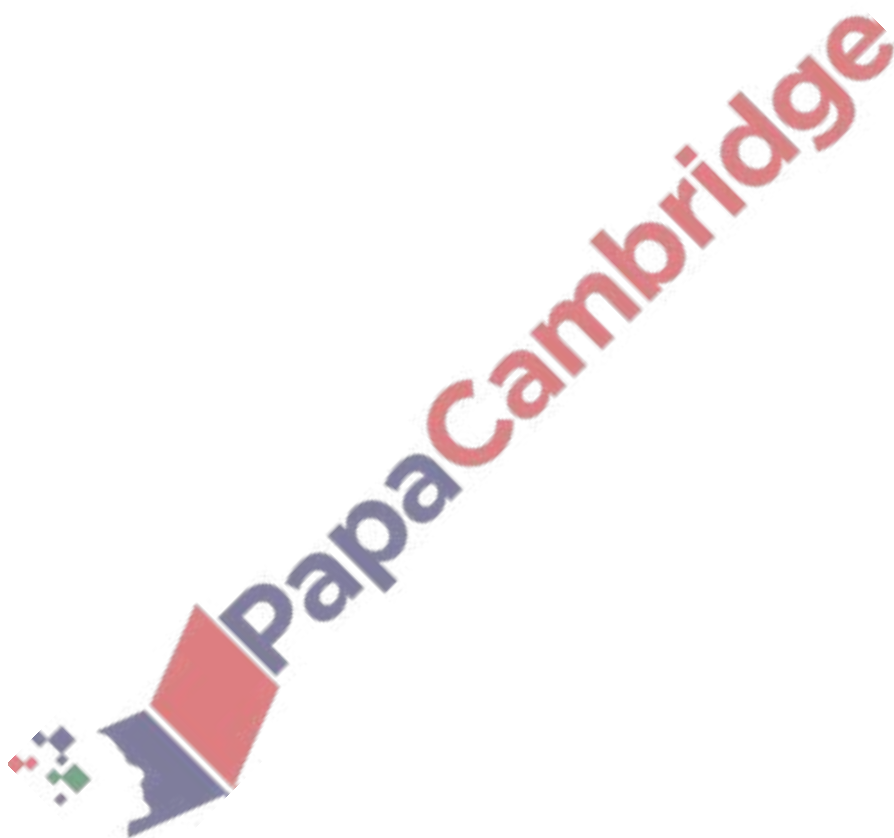


1. **Nov/2022/Paper_9709_31/No.2**

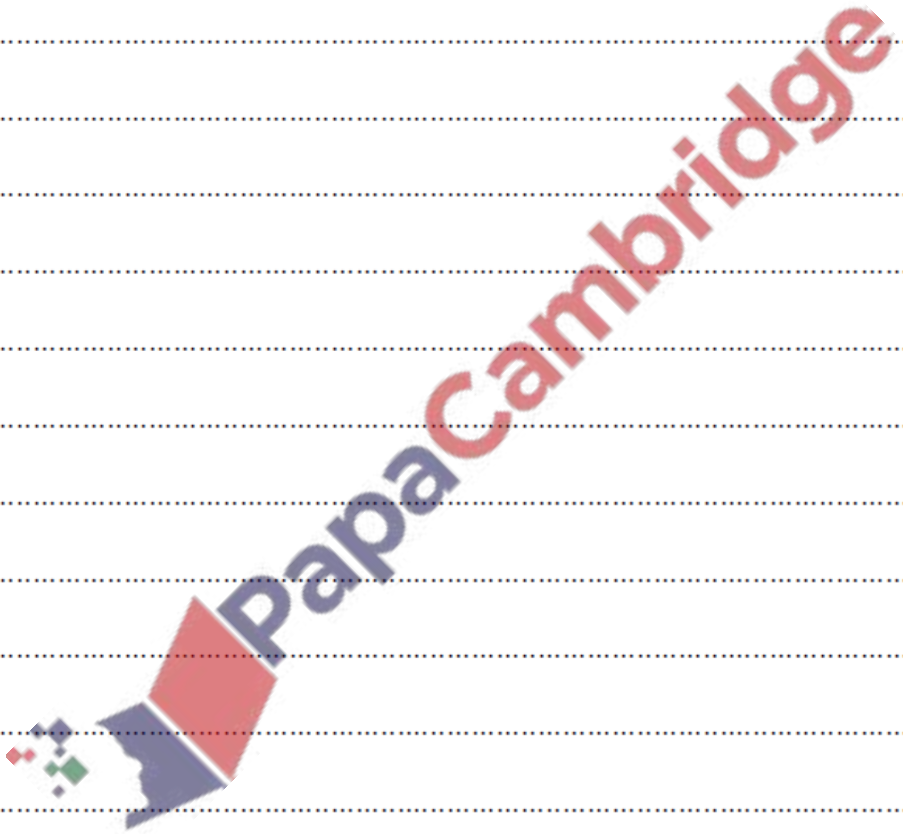
On a sketch of an Argand diagram shade the region whose points represent complex numbers z satisfying the inequalities $|z| \leq 3$, $\operatorname{Re} z \geq -2$ and $\frac{1}{4}\pi \leq \arg z \leq \pi$. [4]



The complex numbers u and w are defined by $u = 2e^{\frac{1}{4}\pi i}$ and $w = 3e^{\frac{1}{3}\pi i}$.

- (a) Find $\frac{u^2}{w}$, giving your answer in the form $re^{i\theta}$, where $r > 0$ and $-\pi < \theta \leq \pi$. Give the exact values of r and θ . [3]

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- (b) State the least positive integer n such that both $\text{Im } w^n = 0$ and $\text{Re } w^n > 0$. [1]

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4. Nov/2022/Paper_9709_33/No.5

- (a) On a sketch of an Argand diagram, shade the region whose points represent complex numbers z satisfying the inequalities $|z + 2| \leq 2$ and $\text{Im } z \geq 1$. [4]

- (b) Find the greatest value of $\arg z$ for points in the shaded region. [2]



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