

$$9(a) \quad (-3i)^{2i} = e^{2i \log(-3i)}$$

$$\text{Now } -3i = 3e^{-i\pi/2} \Rightarrow \log(-3i) = \log 3 - i\pi/2 + 2n\pi i$$

$n=0, \pm 1, \pm 2, \dots$

$$\therefore (-3i)^{2i} = e^{2i [\log 3 - i\pi/2 + 2n\pi i]}$$

$$= e^{2i \log 3} \cdot e^{\pi - 4n\pi}$$

$$= e^{\pi(1-4n)} \{ \cos(2 \log 3) + i \sin(2 \log 3) \}$$

$$9(b) \quad \sin z = \sin x \cosh y + i \cos x \sinh y = 3i$$

$$\Rightarrow \sin x \cosh y = 0, \quad \cos x \sinh y = 3$$

$$\text{1st eqn} \Rightarrow \sin x = 0 \quad (\text{since } \cosh y \neq 0 \text{ for all } y)$$

$$\therefore \boxed{x = n\pi} \quad \text{Sub into 2nd eqn} \Rightarrow (-1)^n \sinh y = 3$$

$$\Rightarrow y = \sinh^{-1} \left( \frac{3}{(-1)^n} \right) = (-1)^n \sinh^{-1}(3)$$

$$\therefore \boxed{z = n\pi + i(-1)^n \sinh^{-1}(3)}$$