100) Find the complex number z in $\sin z = \cosh(-1-\jmath)$

$$\frac{\mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}}{2\jmath}=\frac{\mathfrak{e}^{-1-\jmath}+\mathfrak{e}^{-(-1-\jmath)}}{2}\quad ;\quad \therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\jmath\left(\mathfrak{e}^{-1-\jmath}+\mathfrak{e}^{-(-1-\jmath)}\right)=\mathfrak{e}^{\jmath\frac{\pi}{2}}\cdot\left(\mathfrak{e}^{-1-\jmath}+\mathfrak{e}^{-(-1-\jmath)}\right)$$

$$\therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\mathfrak{e}^{-1-\jmath}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}+\mathfrak{e}^{-(-1-\jmath)}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}=\mathfrak{e}^{-1-\jmath}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}-\left(-\mathfrak{e}^{-(-1-\jmath)}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}\right)$$

$$\therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\mathfrak{e}^{-1-\jmath}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}-\mathfrak{e}^{-\jmath\pi}\mathfrak{e}^{-(-1-\jmath)}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}=\mathfrak{e}^{-1-\jmath+\jmath\frac{\pi}{2}}-\mathfrak{e}^{-\jmath\pi-(-1-\jmath)+\jmath\frac{\pi}{2}}$$

$$\therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\mathfrak{e}^{-1-\jmath+\jmath\frac{\pi}{2}}-\mathfrak{e}^{-(-1-\jmath)-\jmath\frac{\pi}{2}}=\mathfrak{e}^{-1-\jmath+\jmath\frac{\pi}{2}}-\mathfrak{e}^{-(-1-\jmath+\jmath\frac{\pi}{2})}\quad ;\quad \therefore z\jmath=-1-\jmath+\jmath\frac{\pi}{2}$$

$$\therefore z=\frac{-1-\jmath+\jmath\frac{\pi}{2}}{\jmath}=-\jmath\left(-1-\jmath+\jmath\frac{\pi}{2}\right)=-\jmath(-1-\jmath)-\jmath^2\frac{\pi}{2}=-\jmath(-1-\jmath)+\frac{\pi}{2}=\jmath+\jmath^2+\frac{\pi}{2}=-1+\frac{\pi}{2}+\jmath$$

101) Find the complex number z in $\cosh z = \sin(-1-\jmath)$

$$\frac{\mathfrak{e}^{z}+\mathfrak{e}^{-z}}{2}=\frac{\mathfrak{e}^{\jmath(-1-\jmath)}-\mathfrak{e}^{-\jmath(-1-\jmath)}}{2\jmath}\quad ;\quad \therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=-\jmath(\mathfrak{e}^{\jmath(-1-\jmath)}-\mathfrak{e}^{-\jmath(-1-\jmath)})=\mathfrak{e}^{-\jmath\frac{\pi}{2}}(\mathfrak{e}^{\jmath(-1-\jmath)}-\mathfrak{e}^{-\jmath(-1-\jmath)})$$

$$\therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=\mathfrak{e}^{\jmath(-1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}-\mathfrak{e}^{-\jmath(-1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}=\mathfrak{e}^{\jmath(-1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}+\left(-\mathfrak{e}^{-\jmath(-1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}\right)$$

$$\therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=\mathfrak{e}^{\jmath(-1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}+\mathfrak{e}^{\jmath\pi}\mathfrak{e}^{-\jmath(-1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}=\mathfrak{e}^{\jmath(-1-\jmath)-\jmath\frac{\pi}{2}}+\mathfrak{e}^{\jmath\pi-\jmath(-1-\jmath)-\jmath\frac{\pi}{2}}$$

$$\therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=\mathfrak{e}^{\jmath(-1-\jmath)-\jmath\frac{\pi}{2}}+\mathfrak{e}^{-\jmath(-1-\jmath)+\jmath\frac{\pi}{2}}=\mathfrak{e}^{\jmath(-1-\jmath)-\jmath\frac{\pi}{2}}+\mathfrak{e}^{-(\jmath(-1-\jmath)-\jmath\frac{\pi}{2})}$$

$$\therefore z=\jmath(-1-\jmath)-\jmath\frac{\pi}{2}=-\jmath-\jmath^2-\jmath\frac{\pi}{2}=1+\jmath(-1-\frac{\pi}{2})$$

102) Find the complex number z in $\sin z = \cosh(-1+\jmath)$

$$\frac{\mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}}{2\jmath}=\frac{\mathfrak{e}^{-1+\jmath}+\mathfrak{e}^{-(-1+\jmath)}}{2}\quad ;\quad \therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\jmath\left(\mathfrak{e}^{-1+\jmath}+\mathfrak{e}^{-(-1+\jmath)}\right)=\mathfrak{e}^{\jmath\frac{\pi}{2}}\cdot\left(\mathfrak{e}^{-1+\jmath}+\mathfrak{e}^{-(-1+\jmath)}\right)$$

$$\therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\mathfrak{e}^{-1+\jmath}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}+\mathfrak{e}^{-(-1+\jmath)}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}=\mathfrak{e}^{-1+\jmath}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}-\left(-\mathfrak{e}^{-(-1+\jmath)}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}\right)$$

$$\therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\mathfrak{e}^{-1+\jmath}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}-\mathfrak{e}^{-\jmath\pi}\mathfrak{e}^{-(-1+\jmath)}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}=\mathfrak{e}^{-1+\jmath+\jmath\frac{\pi}{2}}-\mathfrak{e}^{-\jmath\pi-(-1+\jmath)+\jmath\frac{\pi}{2}}$$

$$\therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\mathfrak{e}^{-1+\jmath+\jmath\frac{\pi}{2}}-\mathfrak{e}^{-(-1+\jmath)-\jmath\frac{\pi}{2}}=\mathfrak{e}^{-1+\jmath+\jmath\frac{\pi}{2}}-\mathfrak{e}^{-(-1+\jmath+\jmath\frac{\pi}{2})}\quad ;\quad \therefore z\jmath=-1+\jmath+\jmath\frac{\pi}{2}$$

$$\therefore z=\frac{-1+\jmath+\jmath\frac{\pi}{2}}{\jmath}=-\jmath\left(-1+\jmath+\jmath\frac{\pi}{2}\right)=-\jmath(-1+\jmath)-\jmath^2\frac{\pi}{2}=-\jmath(-1+\jmath)+\frac{\pi}{2}=-\jmath+\jmath^2+\frac{\pi}{2}=-1+\frac{\pi}{2}-\jmath$$

103) Find the complex number z in $\cosh z = \sin(-1+\jmath)$

$$\frac{\mathfrak{e}^{z}+\mathfrak{e}^{-z}}{2}=\frac{\mathfrak{e}^{\jmath(-1+\jmath)}-\mathfrak{e}^{-\jmath(-1+\jmath)}}{2\jmath}\quad ;\quad \therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=-\jmath(\mathfrak{e}^{\jmath(-1+\jmath)}-\mathfrak{e}^{-\jmath(-1+\jmath)})=\mathfrak{e}^{-\jmath\frac{\pi}{2}}(\mathfrak{e}^{\jmath(-1+\jmath)}-\mathfrak{e}^{-\jmath(-1+\jmath)})$$

$$\therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=\mathfrak{e}^{\jmath(-1+\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}-\mathfrak{e}^{-\jmath(-1+\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}=\mathfrak{e}^{\jmath(-1+\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}+\left(-\mathfrak{e}^{-\jmath(-1+\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}\right)$$

$$\therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=\mathfrak{e}^{\jmath(-1+\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}+\mathfrak{e}^{\jmath\pi}\mathfrak{e}^{-\jmath(-1+\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}=\mathfrak{e}^{\jmath(-1+\jmath)-\jmath\frac{\pi}{2}}+\mathfrak{e}^{\jmath\pi-\jmath(-1+\jmath)-\jmath\frac{\pi}{2}}$$

$$\therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=\mathfrak{e}^{\jmath(-1+\jmath)-\jmath\frac{\pi}{2}}+\mathfrak{e}^{-\jmath(-1+\jmath)+\jmath\frac{\pi}{2}}=\mathfrak{e}^{\jmath(-1+\jmath)-\jmath\frac{\pi}{2}}+\mathfrak{e}^{-(\jmath(-1+\jmath)-\jmath\frac{\pi}{2})}$$

$$\therefore z=\jmath(-1+\jmath)-\jmath\frac{\pi}{2}=\jmath+\jmath^2-\jmath\frac{\pi}{2}=--1+\jmath(1-\frac{\pi}{2})$$

104) Find the complex number z in $\sin z = \cosh(1-\jmath)$

$$\frac{\mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}}{2\jmath}=\frac{\mathfrak{e}^{1-\jmath}+\mathfrak{e}^{-(1-\jmath)}}{2}\quad ;\quad \therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\jmath\left(\mathfrak{e}^{1-\jmath}+\mathfrak{e}^{-(1-\jmath)}\right)=\mathfrak{e}^{\jmath\frac{\pi}{2}}\cdot\left(\mathfrak{e}^{1-\jmath}+\mathfrak{e}^{-(1-\jmath)}\right)$$

$$\therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\mathfrak{e}^{1-\jmath}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}+\mathfrak{e}^{-(1-\jmath)}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}=\mathfrak{e}^{1-\jmath}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}-\left(-\mathfrak{e}^{-(1-\jmath)}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}\right)$$

$$\therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\mathfrak{e}^{1-\jmath}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}-\mathfrak{e}^{-\jmath\pi}\mathfrak{e}^{-(1-\jmath)}\cdot\mathfrak{e}^{\jmath\frac{\pi}{2}}=\mathfrak{e}^{1-\jmath+\jmath\frac{\pi}{2}}-\mathfrak{e}^{-\jmath\pi-(1-\jmath)+\jmath\frac{\pi}{2}}$$

$$\therefore \mathfrak{e}^{z\jmath}-\mathfrak{e}^{-z\jmath}=\mathfrak{e}^{1-\jmath+\jmath\frac{\pi}{2}}-\mathfrak{e}^{-(1-\jmath)-\jmath\frac{\pi}{2}}=\mathfrak{e}^{1-\jmath+\jmath\frac{\pi}{2}}-\mathfrak{e}^{-(1-\jmath+\jmath\frac{\pi}{2})}\quad ;\quad \therefore z\jmath=1-\jmath+\jmath\frac{\pi}{2}$$

$$\therefore z=\frac{1-\jmath+\jmath\frac{\pi}{2}}{\jmath}=-\jmath\left(1-\jmath+\jmath\frac{\pi}{2}\right)=-\jmath(1-\jmath)-\jmath^2\frac{\pi}{2}=-\jmath(1-\jmath)+\frac{\pi}{2}=-\jmath+\jmath^2+\frac{\pi}{2}=-1+\frac{\pi}{2}-\jmath$$

105) Find the complex number z in $\cosh z = \sin(1-\jmath)$

$$\frac{\mathfrak{e}^{z}+\mathfrak{e}^{-z}}{2}=\frac{\mathfrak{e}^{\jmath(1-\jmath)}-\mathfrak{e}^{-\jmath(1-\jmath)}}{2\jmath}\quad ;\quad \therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=-\jmath(\mathfrak{e}^{\jmath(1-\jmath)}-\mathfrak{e}^{-\jmath(1-\jmath)})=\mathfrak{e}^{-\jmath\frac{\pi}{2}}(\mathfrak{e}^{\jmath(1-\jmath)}-\mathfrak{e}^{-\jmath(1-\jmath)})$$

$$\therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=\mathfrak{e}^{\jmath(1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}-\mathfrak{e}^{-\jmath(1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}=\mathfrak{e}^{\jmath(1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}+\left(-\mathfrak{e}^{-\jmath(1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}\right)$$

$$\therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=\mathfrak{e}^{\jmath(1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}+\mathfrak{e}^{\jmath\pi}\mathfrak{e}^{-\jmath(1-\jmath)}\cdot\mathfrak{e}^{-\jmath\frac{\pi}{2}}=\mathfrak{e}^{\jmath(1-\jmath)-\jmath\frac{\pi}{2}}+\mathfrak{e}^{\jmath\pi-\jmath(1-\jmath)-\jmath\frac{\pi}{2}}$$

$$\therefore \mathfrak{e}^{z}+\mathfrak{e}^{-z}=\mathfrak{e}^{\jmath(1-\jmath)-\jmath\frac{\pi}{2}}+\mathfrak{e}^{-\jmath(1-\jmath)+\jmath\frac{\pi}{2}}=\mathfrak{e}^{\jmath(1-\jmath)-\jmath\frac{\pi}{2}}+\mathfrak{e}^{-(\jmath(1-\jmath)-\jmath\frac{\pi}{2})}$$

$$\therefore z=\jmath(1-\jmath)-\jmath\frac{\pi}{2}=\jmath+\jmath^2-\jmath\frac{\pi}{2}=-1+\jmath(1-\frac{\pi}{2})$$