Answers of Exercises

Module Complex Numbers And Phasors

Exercise 1

$A = 20$; $\omega = 2\pi f = 50\pi$ [rad/sec]; $\varphi = \frac{\pi}{2}$

Exercise 2

a. $\sin(\frac{\pi}{3}) = \frac{\sqrt{3}}{2} = \cos(\frac{\pi}{6})$; $\cos(\frac{\pi}{3}) = \frac{1}{2} = \sin(\frac{\pi}{6})$; $\tan(\frac{\pi}{3}) = \sqrt{3}$; $\tan(\frac{\pi}{6}) = \frac{1}{\sqrt{3}}$; $\sin(\frac{\pi}{4}) = \frac{1}{\sqrt{2}} = \cos(\frac{\pi}{4})$; $\tan(\frac{\pi}{4}) = 1$

b. $\Re e\{e^{j\frac{2\pi}{3}}\} = -\frac{1}{2}$ and $\Im m\{e^{j\frac{2\pi}{3}}\} = \frac{\sqrt{3}}{2}$.

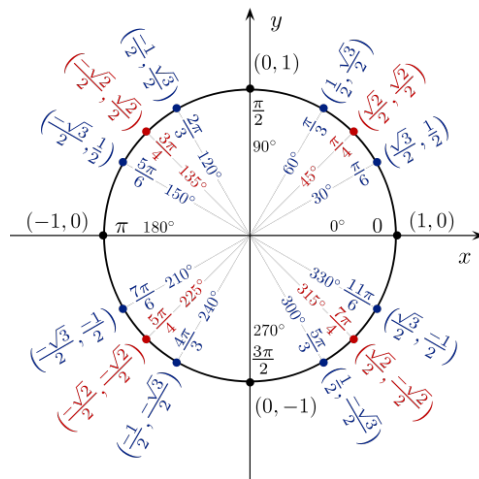c. $\Im m\{e^{j\frac{\pi}{4}}\} = \frac{\sqrt{2}}{2}$. All missing values are depicted in Fig.1.

Figure 1

Exercise 3

a. $z = 2e^{j\frac{\pi}{2}}$

b. $z = \sqrt{3}e^{-j\frac{5\pi}{6}}$

Exercise 4

a. $z = -1 + j$

b. $z = -3j$

Exercise 5

a. $z_3 = (3 + \frac{\sqrt{3}}{2}) + (4\frac{1}{2})j$.

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b. $z_3 = 4\mathrm{j}$

c. $z_3 = -\frac{3}{2}$

Exercise 6

a. $z = 0$

b. $z = -\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2}\mathrm{j}$

c. $z = -\mathrm{j}$

Exercise 7

a. $|z|^2 = 194$

b. $\Re e\{z \cdot \mathrm{e}^{-\mathrm{j}\frac{\pi}{2}}\} = 5$

c. $\Im m\{z\} = \frac{1}{2}$

Exercise 8

a. $z_{1,2} = \pm 6\mathrm{j}.$

b. $z_{1,2} = -4 \pm 2\mathrm{j}$

c. $z_{1,2} = -\frac{1}{2} \pm \frac{\sqrt{3}}{2}\mathrm{j}$

Exercise 9
$A = 2;\ \omega = 300\pi$ and $\varphi = \frac{5\pi}{4}$.

Exercise 10
$\theta = \frac{\pi}{6}$ and $r = 3 - 2\sqrt{3}$ OR $\theta = \frac{5\pi}{6}$ and $r = 3 + 2\sqrt{3}$

Exercise 11
$\psi = 0$ and $M = 0$ OR $\psi = \frac{2\pi}{3}$ and $M = 5\sqrt{3}$.