

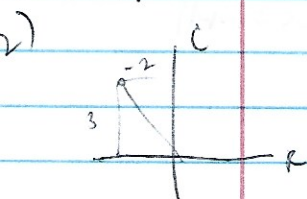
ch 22 ex.

$$\frac{\sin^2 x + \cos^2 x = 1}{\cos \cos \sin}$$

2)  $z = x + iy$   
 $z = 4.5 - i(2.2)$

Real  $\rightarrow 4.5$

Imaginary  $\rightarrow 2.2$



3)  $z = 4 + i(3)$

$z = r \angle \theta$

$\tan \theta = \frac{y}{x} = \frac{3}{4} = \frac{3}{4}$

$\theta = 36.9^\circ$

$r = \sqrt{1^2 + 3^2} = \sqrt{10} = 3.16$   
 $= 5$

$z = 5 \angle 36.9^\circ$

$= 0.64 \text{ rad}$

4)  $z = r e^{i\theta}$   $z = 4 + 3i$

$r = 5$

$\theta = \tan^{-1}\left(\frac{3}{4}\right) = \tan^{-1}\left(\frac{3}{4}\right)$   
 $= 0.64 \text{ rad}$

$z = 5 e^{i(0.64)}$

5)  $z = i$   $r = 1$   $\theta = 0$

b)  $z = r \angle \theta$

$\left(\tan^{-1}\left(\frac{1}{0}\right)\right) = ?$

$r = \sqrt{1^2 + 0^2} = 1$

$\theta = \tan^{-1}\left(\frac{1}{0}\right) = ?$

$z = 1 \angle \frac{\pi}{2} \text{ rad}$

c)  $z = r e^{i\theta} = e^{i\frac{\pi}{2}}$

6)  $z = r \angle \theta = 5 \angle \frac{\pi}{6} \text{ rad}$

$r = \sqrt{r_c^2 + r_n^2}$   $\theta = \tan^{-1}\left(\frac{r_n}{r_c}\right)$

$25 = r_c^2 + r_n^2$   $r_n^2 = r_c^2 \tan^2 \theta$

$r_c^2 (\tan^2 \theta + 1) = 25$

$r_c^2 = \frac{25}{\sec^2 \theta}$

$r_c = \sqrt{\frac{25}{\sec^2(\frac{\pi}{6})}}$   
 $= \frac{5\sqrt{3}}{2}$

$r_n = r_c \tan \theta = \frac{5\sqrt{3}}{2} \tan\left(\frac{\pi}{6}\right)$   
 $= \frac{5}{2}$

7)  $3 + 4i + 2 - 2i = 5 + 2i$

8)  $z_1 = 4 \angle \frac{\pi}{6}$   $z_2 = 3 \angle \frac{\pi}{4}$

$z = r \angle \theta = r_c + j r_n$

$r_c = r \cos \theta$   $r_n = r \sin \theta$

$r_c = r \cos \theta$   $r_n = r \sin \theta$

$r e^{i\theta} = r \cos \theta + j r \sin \theta$

$r_c + j r_n = r \cos \theta + j r \sin \theta$

$= (4) \cos \frac{\pi}{6} + j (4) \sin \frac{\pi}{6} = 3.46 + 2j$

$z_2 = 3 \cos \frac{\pi}{4} + j 3 \sin \frac{\pi}{4} = 2.12 + j 2.12$

$z = 5.58 + j 4.12$

$= \sqrt{5.58^2 + 4.12^2} \angle \tan^{-1}\left(\frac{4.12}{5.58}\right)$

$= 6.94 \angle 0.64$

$= (6.94) e^{i 0.64}$

$$9) z_1 z_2 = r_1 r_2 \angle (\theta_1 + \theta_2)$$

$$= 12 \cdot 2 \angle \frac{5\pi}{12}$$

$$= 24 e^{\frac{5\pi}{12} i}$$

$$10) (3+4i)(2-3i)$$

$$= 6 - 9i + 8i - 12i^2$$

$$= 6 - i + 12 = 18 - i$$

$$11) \frac{z_1}{z_2} = \frac{r_1}{r_2} \angle (\theta_1 - \theta_2)$$

$$= \frac{5}{2} \angle \frac{\pi}{4}$$

$$12) 3.00 + 4i / 2 - 3i$$

$$z_1 = \sqrt{3^2 + 4^2} \angle \tan^{-1}(\frac{4}{3}) = 5 \angle 0.93$$

$$z_2 = \sqrt{2^2 + 3^2} \angle \tan^{-1}(\frac{3}{2}) = 3.6 \angle -0.98$$

$$\frac{z_1}{z_2} = 1.38 \angle 1.91$$

$$13) z = 5 + 16i$$

$$z^* = 5 - 16i$$

$$14) z^* = 2 + 3i$$

$$15) z^* = 5 e^{-\frac{\pi}{6} i}$$

$$16) z^* = 2 e^{\frac{\pi}{6} i}$$

$$17) z^* = z = 4 \angle -\frac{\pi}{3} \text{ rad}$$

$$18) v(t) = V_0 \sin(\omega t + 0.175)$$

$$\left( \cos \theta = \sin(90^\circ - \theta) \right)$$

$$\omega = \frac{2\pi}{T} = \frac{2\pi}{1.13}$$

$$= V_0 \cos(\omega t + 1.396)$$

$$\cos = 0 - \frac{\pi}{2}$$

$$v(t) = V_0 \cos(\omega t - 1.396)$$

$$9) z_c = \frac{1}{i\omega C} = \frac{1}{i(2\pi)(600\text{Hz})(10\mu\text{F})}$$

$$= \frac{1}{265.3\Omega}$$

$$z_c = -265.3\Omega i$$

$$z_c = -iX_c$$

$$X_c = 265.3\Omega$$

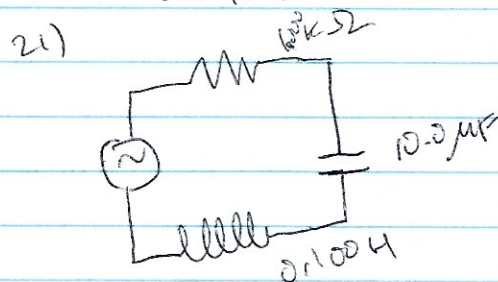
$$20) z_L = i\omega L$$

$$= i(2\pi)(60\text{Hz})(25.0\text{mH})$$

$$= 9.4i\Omega$$

$$z_L = iX_L$$

$$X_L = 9.4\Omega$$



$$z_R = R = 1.000k\Omega$$

$$z_c = \frac{1}{i\omega C} = \frac{1}{i(2\pi)(60\text{Hz})(10.0\mu\text{F})}$$

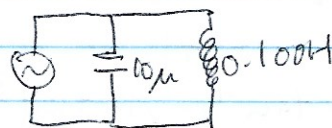
$$= -265i\Omega$$

$$z_L = i\omega L = i(2\pi)(60\text{Hz})(0.100\text{H})$$

$$= 37.7i\Omega$$

$$z_{eq} = z_R + z_L + z_c = (1,000 - 227i)\Omega$$

22)



$$\text{from 21, } z_c = -265i\Omega$$

$$z_L = 37.7i\Omega$$

$$z_{eq} = \left( \frac{1}{z_c} + \frac{1}{z_L} \right)^{-1}$$

$$= \left( \frac{1}{-265i\Omega} + \frac{1}{37.7i\Omega} \right)^{-1}$$

$$= \frac{44.0\Omega}{i} = \sqrt{-44i\Omega}$$

$$z_{eq} = 44i\Omega$$