SM5083
Assignment Number 02

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SM21MTECH12005

1. Chapter III miscellaneous example IV Q.1

1.1. show that the equation of line joining $(r_1, \theta_1), (r_2, \theta_2)$ is

$$\frac{1}{r}\sin(\theta_1 - \theta_2) = \frac{1}{r_1}\sin(\theta - \theta_2) + \frac{1}{r_2}\sin(\theta - \theta_1)$$

Solution:
let

$$\begin{vmatrix} r\cos\theta & r_1\cos\theta_1 & r_2\cos\theta_2 \\ r\sin\theta & r_1\sin\theta_1 & r_2\sin\theta_2 \\ 1 & 1 & 1 \end{vmatrix} = 0 \qquad (1.1.1)$$

$$\begin{aligned} r_1 r_2(\cos\theta_1\sin\theta_2 - \sin\theta_1\cos\theta_2) \\ -rr_2(\cos\theta\sin\theta_2 - \sin\theta\cos\theta_2) \\ +rr_1(\cos\theta\sin\theta_1 - \sin\theta\cos\theta_1 = 0 \end{aligned} \qquad (1.1.2)$$

$$\begin{aligned} -r_1 r_2\sin(\theta_1 - \theta_2) + rr_2\sin(\theta - \theta_2) \\ -rr_1\sin(\theta - \theta_1) = 0 \end{aligned} \qquad (1.1.3)$$

now rearranging the equation 1.1.3 we get

$$\frac{1}{r}\sin(\theta_1 - \theta_2) = \frac{1}{r_1}\sin(\theta - \theta_2) + \frac{1}{r_2}\sin(\theta - \theta_1) \qquad (1.1.4)$$