

Answers of Tutorial Sheet – 1

$$\text{Q.1(a). } \frac{\pi}{2} + \frac{4}{\pi} \left(\frac{\cos x}{1^2} + \frac{\cos 3x}{3^2} + \frac{\cos 5x}{5^2} + \dots \right)$$

$$\text{Q.1(b). } \frac{4}{\pi^3} \left((\pi^2 - 4) \sin \pi x + \frac{1}{27} (9\pi^2 - 4) \sin 3\pi x + \frac{1}{125} (25\pi^2 - 4) \sin 5\pi x + \dots \right) \\ - \frac{2}{\pi} \left(\sin 2\pi x + \frac{1}{2} \sin 4\pi x + \frac{1}{3} \sin 6\pi x + \dots \right)$$

$$\text{Q.1(c). } \frac{4}{\pi} \left(\sin x - \frac{1}{9} \sin 3x + \frac{1}{25} \sin 5x - \dots \right)$$

$$\text{Q.1(d). } \frac{1}{4} + \frac{4}{\pi^2} \left(\cos \frac{\pi x}{4} + \frac{1}{2} \cos \frac{2\pi x}{4} + \frac{1}{9} \cos \frac{3\pi x}{4} + \frac{1}{25} \cos \frac{5\pi x}{4} + \frac{1}{18} \cos \frac{6\pi x}{4} + \frac{1}{49} \cos \frac{7\pi x}{4} + \dots \right)$$

$$\text{Q.1(e). } \frac{\pi^2}{3} - 4 \left(\frac{\cos x}{1^2} - \frac{\cos 2x}{2^2} + \frac{\cos 3x}{3^2} - \dots \right) + 2 \left(\frac{\sin x}{1} - \frac{\sin 2x}{2} + \frac{\sin 3x}{3} - \dots \right)$$

$$\text{Q.1(f). } \frac{1}{\pi} - \frac{2}{\pi} \sum_{n=1}^{\infty} \left(\frac{\cos 2nx}{4n^2 - 1} \right) + \frac{1}{2} \sin x$$

$$\text{Q.2(a). } 1 + \frac{8}{\pi^2} \left(\cos \frac{\pi x}{2} + \frac{1}{9} \cos \frac{3\pi x}{2} + \frac{1}{25} \cos \frac{5\pi x}{2} + \dots \right) \\ \frac{4}{\pi} \left(\sin \frac{\pi x}{2} + \frac{1}{2} \sin \frac{2\pi x}{2} + \frac{1}{3} \sin \frac{3\pi x}{2} + \frac{1}{4} \sin \frac{4\pi x}{2} + \dots \right)$$

$$\text{Q.2(b). } \frac{L^2}{3} - \frac{4L^2}{\pi^2} \left(\cos \frac{\pi x}{L} - \frac{1}{4} \cos \frac{2\pi x}{L} + \frac{1}{9} \cos \frac{3\pi x}{L} - \frac{1}{16} \cos \frac{4\pi x}{L} + \dots \right) \\ \frac{2L^2}{\pi} \left(\left(\frac{1}{1} - \frac{4}{1^3 \pi^2} \right) \sin \frac{\pi x}{L} - \frac{1}{2} \sin \frac{2\pi x}{L} + \left(\frac{1}{3} - \frac{4}{3^3 \pi^2} \right) \sin \frac{3\pi x}{L} - \frac{1}{4} \sin \frac{4\pi x}{L} + \dots \right)$$

$$\text{Q.2(c). } \frac{3}{2} - \frac{2}{\pi} \left(\cos \frac{\pi x}{2} - \frac{1}{3} \cos \frac{3\pi x}{2} + \frac{1}{5} \cos \frac{5\pi x}{2} - \frac{1}{7} \cos \frac{7\pi x}{2} + \dots \right) \\ \frac{6}{\pi} \left(\sin \frac{\pi x}{2} - \frac{1}{3} \sin \frac{2\pi x}{2} + \frac{1}{3} \sin \frac{3\pi x}{2} + \frac{1}{5} \sin \frac{5\pi x}{2} - \frac{1}{9} \sin \frac{6\pi x}{2} + \dots \right)$$

$$\text{Q.2(d). } \frac{3\pi}{8} - \frac{2}{\pi} \left(\cos x + \frac{1}{2} \cos 2x + \frac{1}{9} \cos 3x + \frac{1}{25} \cos 5x + \frac{1}{18} \cos 6x + \frac{1}{49} \cos 7x + \dots \right) \\ \left(1 + \frac{2}{\pi} \right) \sin x - \frac{1}{2} \sin 2x + \left(\frac{1}{3} - \frac{2}{9\pi} \right) \sin 3x - \frac{1}{4} \sin 4x + \left(\frac{1}{5} + \frac{2}{25\pi} \right) \sin 5x - \frac{1}{6} \sin 6x + \dots$$

$$\text{Q.2(e). } \frac{\pi^2}{6} - 4 \left(\frac{\cos 2x}{2^2} + \frac{\cos 4x}{4^2} + \frac{\cos 6x}{6^2} - \dots \right) \\ \sum_{n=1}^{\infty} \left(\frac{8}{(2n-1)^3 \pi} \sin(2n-1)x \right)$$