



TOPIC: 11 - HARMONIC ANALYSIS

Harmonic Analysis:

The process of finding the fourier

series for a function given by such values of

series for a function given by such values of

the function and independent variable is known

the function analysis.

$$y = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos nx + \sum_{n=1}^{\infty} b_n \sin x$$

where $a_0 = 2\left(\frac{\sum y}{n}\right)$
 $a_1 = 2\left(\frac{\sum y}{n}\right)$





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$\frac{y}{800} = \frac{1.9}{1.0} = \frac{1.9}{1.9} = \frac{1.7}{1.5} = \frac{1.2}{1.0}$ $\frac{y}{1.0} = \frac{a_0}{2} + a_1 \cos x + a_2 \cos 2x + b_1 \sin x + b_2 \sin 2x$ $a_0 = 2\left[\frac{2y}{n}\right] = 2\left(\frac{8.7}{6}\right) = 2(1.45) = 2.9$ $a_1 = 2\left[\frac{2y\cos x}{n}\right] = 2\left(\frac{-1.1}{6}\right) = -0.2667$	$ \frac{g}{g} = \frac{1.9}{2} + \frac{1.9}{1.9} = \frac{1.7}{1.5} = \frac{1.2}{1.0} $ $ \frac{g}{g} = \frac{1.9}{2} + \frac{1.9}{1.0} = \frac{1.9}{2000000000000000000000000000000000000$	806. 806. $y = \frac{a_0}{2} + a_1 \cos x + a_2 \cos 2x + b_1 \sin x + b_2 \sin 2x$ $a_0 = a \left[\frac{2y}{n} \right] = a \left(\frac{8.7}{6} \right) = 2 (1.45) = 2.9$ $a_1 = 2 \left[\frac{2y \cos x}{n} \right] = 2 \left(\frac{-0.3}{6} \right) = -0.2667$ $a_2 = 2 \left[\frac{2y \cos x}{n} \right] = 2 \left(\frac{-0.3}{6} \right) = -0.1$ $a_1 = 2 \left[\frac{2y \sin x}{n} \right] = 2 \left(\frac{-0.5196}{6} \right) = 0.1732$ $a_2 = 2 \left[\frac{2y \sin x}{n} \right] = 2 \left(\frac{-0.1732}{6} \right) = -0.0577$ $a_1 = 2 \left[\frac{2y \sin x}{n} \right] = 2 \left(\frac{-0.1732}{6} \right) = -0.0577$ 8ub there values in $a_1 = a_1 = a_2 = a_2 = a_3 = a_4$		0	T	211	TI	<u>41</u>	511	277
Sely $ y = \frac{a_0}{2} + a_1 \cos x + a_2 \cos 2x + b_1 \sin x + b_2 \sin 2x $ $ a_0 = 2\left[\frac{2y}{n}\right] = 2\left(\frac{8.7}{6}\right) = 2(1.45) = 2.9 $ $ a_1 = 2\left[\frac{2y\cos 2\eta}{n}\right] = 2\left(\frac{-1.1}{6}\right) = -0.2667 $	Sol. $y = \frac{a_0}{2} + a_1 \cos x + a_2 \cos 2x + b_1 \sin x + b_2 \sin 2x$ $a_0 = 2 \left[\frac{2y}{n} \right] = 2 \left(\frac{8.7}{6} \right) = 2(1.45) = 2.9$ $a_1 = 2 \left[\frac{2y \cos 2x}{n} \right] = 2 \left(\frac{-1.1}{6} \right) = -0.2667$ $a_2 = 2 \left[\frac{2y \cos 2x}{n} \right] = 2 \left(\frac{-0.3}{6} \right) = -0.1$ $b_1 = 2 \left[\frac{2y \sin 2}{n} \right] = 2 \left(\frac{-0.5196}{6} \right) = 0.1732$ $b_2 = 2 \left[\frac{2y \sin 2x}{n} \right] = 2 \left(\frac{-0.1732}{6} \right) = -0.0577$	Solidary = $\frac{a_0}{2} + a_1 \cos x + a_2 \cos 2x + b_1 \sin x + b_2 \sin 2x$ $a_0 = 2 \left[\frac{2y}{n} \right] = 2 \left(\frac{8.7}{6} \right) = 2(1.45) = 2.9$ $a_1 = 2 \left[\frac{2y \cos 2x}{n} \right] = 2 \left(\frac{-1.1}{6} \right) = -0.2667$ $a_2 = 2 \left[\frac{2y \cos 2x}{n} \right] = 2 \left(\frac{-0.3}{6} \right) = -0.1$ $b_1 = 2 \left[\frac{2y \sin 2x}{n} \right] = 2 \left(\frac{0.5196}{6} \right) = 0.1732$ $b_2 = 2 \left[\frac{2y \sin 2x}{n} \right] = 2 \left(\frac{-0.1732}{6} \right) = -0.0577$ Sub these values in O .	y							1.0
	$b_1 = 2 \left[\frac{2y \sin 2}{n} \right] = 2 \left(\frac{0.5196}{6} \right) = 0.1732$ $b_2 = 2 \left[\frac{2y \sin 2x}{n} \right] = 2 \left(\frac{-0.1732}{6} \right) = -0.0577$	$b_1 = 2 \left[\frac{2y \sin 2}{n} \right] = 2 \left(\frac{0.5196}{6} \right) = 0.1732$ $b_2 = 2 \left[\frac{2y \sin 2x}{n} \right] = 2 \left(\frac{-0.1732}{6} \right) = -0.0577$ $8ub there values in O.$	Sol.	a	y = 2 $y = 2$	24 m	= 2(=	$\left(\frac{8\cdot7}{6}\right) = 2$ $\left(\frac{-1\cdot1}{b}\right) = 2$	· -0.2667	19 Sin22





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yeasa	-	1.0	-0.95	1.7	2	-0.75	2	6.6			-1.1
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Cosx	_	0.5	١٥٠ م	1		15.0-	40.0		1		





2. Compu Serces	of f	(x)	from	the	te	able	below.	
32	0	T 6	7 3	7 2	3	6	7	
y	1.98	1.3	1.05	1.3	-0.88	<u>57</u> 6	1.98	12
Sol:	a	0 = x 0 = x	2 [2 4	$\frac{cos\theta}{n} = \frac{cos\theta}{n} = \frac{7}{n}$ $\frac{cos\theta}{n} = \frac{7}{n}$ $\frac{sin\theta}{n} = \frac{7}{n}$	= 2 = 2 = = = = = = = = = = = = = = = =	2.67 3.0137 6	= 0.37	00
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yesse	86.1	0.65	- 0.525	1.3	44.0	0-125	2,67
ysins	0	1,1258 -0.65	0.9693	0	0.7621	0.2165	3.0137
gross	86.1	0.67	-0.525	1.3	40.0+	-0. 125	1.12
Sinzo	0	0.866	-0.866	9 44.	993.0	-0.466	
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Ring		0.8660	0.8660	0	-0.866	999.0-	1.0
Dy C		5.0	10.0	1-1-	10.5	0.5	- 12
	20 0		105	· 63	49 C240 -0.88	511(54) -0.25	4.5
	05	O (%)	25 (w)	(1) (160)	AM (200)	5 (50)	





3 Find the fourier series as far as the second harmonic to represent the function given in the following data: 28 fex Sol \$(x) = \frac{a_0}{2} + \frac{\xi}{2} \tan \text{cos} \frac{\pi \pi \pi}{3} + \frac{\xi}{n=1} \text{ bn sin \frac{\pi \pi \pi}{3}} ao = 2 = 2 = 2 = 2 = 41.6667 $a_1 = 2 \left[\frac{2y \cos \frac{\pi}{3}}{1} \right] = 2 \left[\frac{-25}{6} \right] = -8.333$ $a_2 = 2 \left[\frac{\sum y \cos \frac{2\pi x}{3}}{3} \right] = 2 \left[\frac{7}{6} \right] = -2.833$ b) = 2 [5 y sin 7 2 7 = 2 [-3.464] = -1.1547 be= 2 [= 2 | o] = 0. fix)= 41.6667 + (-8.333) (05 T12 + (-2.333) (0527)2 + (-1.1547) Sin912





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30		6	18	74	28	2.4		70	120	tets	