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• Half Range Sine & Cosine Series.
Note: Half range series we have to find on interval (0,1). Hence no need to find I separately It is already given in interval.
Problems: Find Half range sine in Cosine Series for $f(\pi) = 1 \times - x^2$ $0 < x < 1$ From sine Series Prove that; 1
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
$\frac{Sd^{n} Cosine Senies:}{2 + \sum_{n=1}^{\infty} a_{n} \cos(n\pi x)} \cdot \frac{1}{2}$
$a_0 - 2 \int_{-2}^{2} f(x) dx$ $- 2 \int_{-2}^{2} f(x) dx$
$= \frac{2}{\lambda} \left[\frac{1}{2} \frac{1}{3} \right]^{\frac{1}{2}}$
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
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	an= 2 star cos (nIIX) dx
	$= 2 \int_{1}^{2} (2x-x^{2}) \cos(n\pi x) dx$
	$= 2 \left[(l\chi - \chi^2) \left[\frac{\sin(n\pi\chi)}{2} \right] - (l-2\chi) \left[-\cos(\frac{n\pi\chi}{2}) \right] - \frac{\sin(n\pi\chi)}{2} \right]$
	$+ (-2) - \sin(\frac{n\pi}{2})$ $(\frac{n\pi}{2})^3$
	$(\underline{n}\underline{n})^3$
	$-\frac{2}{2}\left[0-(-2)\left[-\cos n\pi \left(\frac{1}{n\pi}\right)+0-0+2\left[-\left(\frac{1}{n\pi}\right)-0\right]\right]$
	a [nit]
	$-2[-(-1)^{n}]^{3}-1^{3}$
	$= 2 \left[-(-1)^{n} l^{3} - l^{3} \right]$ $= 2 \left[(n\pi)^{2} (n\pi)^{2} \right]$
	$= -2 l^{3} [1 + (-1)^{n}]$
	$= \frac{-2l^2}{n^2H^2} \left[1 + (-1)^n \right]$
	Exom (i) we get, ∞ $ \begin{array}{c c} \downarrow (\pi) = 1^2 \\ 3\times2 & 1 \end{array} $ $ \begin{array}{c c} (-21^2) & (1+(-1)^n) & \cos(n\pi\pi) \\ n^2 & \Pi^2 \end{array} $
	$\frac{2(\pi)}{2(\pi)^2} = \frac{12}{12(\pi)^2} = \frac{(1+(-1)^2)(\cos(n\pi))}{(1+(-1)^2)(\cos(n\pi))}$
	3×2 2 (11 11)
	$= \ell^2 - 2\ell^2 \sum_{n=1}^{\infty} \left[1 + (-1)^n\right] \cos\left(n\pi x\right)$
	\sim $+2$ \sim n^2
	6 11 ns) 11
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	Sine series - ao=0, an=0
	~
,	$f(x) = \sum_{n \in Sin(ntt x)} b_n sin(ntt x)$
+	$n \in \mathbb{N}$
	$b_n = \frac{2}{l} \int_{-l}^{l} f(x) \sin(n\pi x) dx$
	$= 2 \left(l \left(1 - \chi^2 \right) c \ln \left(n \pi \chi \right) d x$
	$-2\int_{0}^{1}(1x-x^{2})\sin(n\pi x)dx$
	$= \frac{2 \left(\left(\left(\left(\frac{n\pi}{2} \right) \right) \right) - \left(\left(\frac{n\pi}{2} \right) \right) - \left(\left(\frac{n\pi}{2} \right) \right) - \left(\frac{n\pi}{2} \right) \right)}{\left(\frac{n\pi}{2} \right)^2}$
	+ (-2) [cos (n/x)]/
	$\left(\frac{n\pi}{3}\right)^3$
	$= 2 \left[0 - 0 - 2 \right] \cos n \pi \left(\frac{3}{n \pi} \right) - 0 + 0 - (-2)(i)(2)^{3} $
	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
	$\frac{-2}{2} \frac{2}{1} \frac{3}{1} \left[1 - (-1)^{n} \right]$
	& n ³ π ³ L
	$=\frac{4l^2}{n^3H^3}\left[1-(-1)^n\right]$
1	n ³ H ³
	from @ we got
· -	<u> </u>
	f(n) - \(\frac{4\lambda^2}{n^3 \tau \text{sin(n\tau \text{n\text{TX}})}}
	$=41^{2} \sum_{n=1}^{\infty} \left[1-(-1)^{n}\right] \sin(n\pi x)$
	$\frac{3}{113}$ $\frac{41}{n^2}$ $\frac{1}{n^3}$ $\frac{1}{n^3}$ $\frac{1}{n^3}$
	= 412 2 sin(TIX) + 0 + 2 sin(3TIX) +0+
	$\frac{241}{17^3} \left[\frac{2}{13} \frac{51}{11} \frac{11}{11} \frac{11}{11} \frac{2}{3} \frac{51}{11} \frac{51}{11} \frac{11}{11} \frac$
-	$-41^{2}x^{2}\left[\frac{1}{13}Sm(\pi x)+\frac{1}{3}Sin(3\pi x)+\right]$
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	$[1x-x^{2}-8]^{2}$ $[\frac{1}{1^{3}}]^{3}$ $[\frac{1}{3}]^{3}$ $[\frac{1}{3}]^{3}$ $[\frac{3\pi x}{1}]^{3}$
	$pud x = \frac{1}{2}$, we get
	$\frac{9^2-9^2-89^2}{2}$ $\frac{1}{13}$ $\frac{(1)}{13}$ $\frac{1}{3}$ $\frac{(-1)}{3}$
	$\frac{2l^2 - l^2}{4} - 8l^2 \left[\frac{1}{l^3} - \frac{1}{3^3} + \right]$
	$\frac{12^{2} \times 17^{3}}{481^{2}} = \frac{1}{1^{3}} = \frac{1}{3^{3}} $
	$\frac{\pi^3}{32} - \frac{1}{13} - \frac{1}{3^3} + \cdot \cdot$
	By Parseval's Identity for sine conice
	By Parseval's Identity for Sine Sories 2 (lf(x))2 dx = \sum_{pol} bn
Section 2	$\Rightarrow 2 \int_{1}^{1} \left[(2x - x^{2})^{2} dx - \sum_{n=1}^{\infty} \left[\frac{4 \cdot x^{2}}{n^{3} \cdot \pi^{3}} (1 - (-1)^{n})^{\frac{n}{2}} \right] \right]$
	$\Rightarrow 2 \int_{0}^{1} (e^{2}x^{2} - 2ex^{3} + x^{4}) dx - \sum_{0}^{\infty} \frac{16e^{4}}{n^{6}\pi^{6}} (1 - (-1)^{n})^{2}$ $\Rightarrow 2 \int_{0}^{1} (e^{2}x^{2} - 2ex^{3} + x^{4}) dx - \sum_{0}^{\infty} \frac{16e^{4}}{n^{6}\pi^{6}} (1 - (-1)^{n})^{2}$
	$\Rightarrow 2 \left[\frac{12x^3}{3} - 2 \cdot 10x^4 + x^5 \right]^{\frac{1}{2}} = \frac{16x^4}{5} = 16$
	$\frac{3}{1} = \frac{2}{3} \left[\frac{15}{42} + \frac{9}{5} \right] = \frac{16}{16} \cdot \frac{9}{16} \left[\frac{2^2}{16} + 0 + \frac{2^2}{3^6} + 0 + \cdot \right]$
	$\frac{3}{30} = \frac{2}{81614} = \frac{2}{16} + \frac{1}{36} + = \frac{1}{36}$
	≥ 18 × 176 - 4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	$\frac{1}{300000000000000000000000000000000000$
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	⇒ 116 = 1 + 1 +
	960 16 36 7
	How To prove,
	M6 - 1 - 1 - +
	945 16 26 36
	het,
	S - 1 + 1 +
	16 + 26 36
	$=\left(\frac{1}{16}+\frac{1}{36}+\frac{1}{46$
	$-\frac{716}{960} + \frac{1}{(2\cdot1)^6} + \frac{1}{(2\cdot2)^6} + \frac{1}{(2\cdot3)^6} + \frac{1}{(2\cdot3)^6}$
,	$S = TI^{6} + 1$ $960 + 2^{6} + 1^{6} + 2^{6} + 3^{6} + \cdots$
	()
	S - 176 + 1 (S) 960 + 64
	⇒ S - S = 116
	64 960
	- 63S - 116
	64 960
	=> S= 116 × 644.
	960 63
	15
*.71	_ 116
	15763
7	3 5 - 1 - 1 - 1 - 1 - 26 T 26 T 26 T
	945 16 20 3 175
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	Obtain half range sine series for f(x)= x2
	Obtain har range sin
	in 0 <x<3< td=""></x<3<>
<u>.Sd</u>	Here, 1=3.
	For half range sine series a0=0, an=0
	: +(x)= > bn Sin(ntx)
	n=1
	$= \sum_{n=0}^{\infty} b_n \sin(n\pi x) - (i)$
	n=1
	bn=2 (1 fm) sin(nTX) dx
	$-2\int_{3}^{3} \chi^{2} \sin\left(n\pi\chi\right) d\eta$
	3
	$= \frac{2 \left[\chi^2 \left(-\cos\left(\frac{n\pi\chi}{3}\right) \right] - \left(2\chi\right) \left(-\sin\left(\frac{n\pi\chi}{3}\right) + 2\left(\cos\left(\frac{n\pi\chi}{3}\right)\right) \right]}{(n\pi)^2}$
	$\frac{3}{3}\left[\frac{\left(\frac{n\pi}{3}\right)^2}{\left(\frac{n\pi}{3}\right)^2}\right] \left(\frac{n\pi}{3}\right)^3$
	1 3
*	$= 2 \left[9(-\cos n\pi)/3 \right] - 0 + 2 \left(\cos(n\pi) 3^3 - 0 + 0 - 2(1) 3^3 \right]$
	$= 2 \left[9(-\cos n\pi) \left(\frac{3}{3} \right) - 0 + 2 \left(\cos (n\pi) \frac{3^3}{3^3} - 0 + 0 - 2(1) \frac{3^3}{3^3} \right) \right]$
	$\frac{2 \left(27 \left(-(-1)^{n}\right) + 2 \times 27 \left(-1\right)^{n} + 2 \times 27}{3 \left(n^{n}\right)} + \frac{2 \times 27}{n^{3} n^{3}} $
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
	$=2\times27\left[-(-1)^{n}+2(-1)^{n}-2\right]$
	$\frac{2}{31}$ $n\pi$ $\frac{1}{3}$
	5 C-M - C-M
	$-18 2(-1)^{7}-2 - (-1)$ $n^{3} \pi^{3} \qquad n\pi$
	$f(x) = \frac{1}{2} \frac{18[2(-1)^{n}-2]}{(-1)^{n}} \sin(n\pi x)$
	$\frac{1}{18} \frac{1}{12} \frac$
-	- From (1)
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3)	Find Half ronge sine series for
	BAN= X 0 < X < 2
	$-4-\alpha$ $2 \le \alpha \le 4$.
San	Given interval in (0,4) l=4.
	For Half range sine series a0=0 & an=0
	$f(x) = \sum_{n=1}^{\infty} b_n \sin(n\pi)$
	nel
	$-\sum_{n=1}^{\infty} b_n \sin\left(\frac{n\pi x}{4}\right) - (1)$
	bn= 2 (fru) sin (nox) dx
	II
	$= \frac{2}{4} \int_{-\frac{\pi}{4}}^{4} f(x) \sin\left(\frac{n\pi}{4}\right) dx$
	502 C \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
	$-\frac{1}{2} \int_{-\frac{\pi}{4}}^{2} x \sin(n\pi x) dx + \int_{-\frac{\pi}{4}}^{4} (4-x) \sin(n\pi x) dx$
	$=\frac{1}{2}\left[x\left(-\cos\left(\frac{n\pi x}{4}\right)\right)-\left(1\right)\left(-\sin\left(\frac{n\pi x}{4}\right)\right)\right]$
	$+\left[(4-x)\left(-\cos\left(\frac{n\pi x}{4}\right)\right)-(-1)\left(-\sin\left(\frac{n\pi x}{4}\right)\right)\right]$
	$-\frac{1}{2}\left(2\left(-\cos\left(\frac{n\pi}{2}\right)\right)\frac{4}{n\pi}+\sin\left(\frac{n\pi}{2}\right)\left(\frac{4}{n\pi}\right)^{2}-0+0\right)$
	$+0-0-(2)(-(05(n\pi)(4)+(4)(-5in(n\pi)(4)^2)$
	$=\frac{1}{2} \left[-\frac{8}{n\pi} \cos(n\pi) + \frac{16}{2} \sin(n\pi) + \frac{8}{2} \cos(n\pi) + \frac{16}{2} \sin(n\pi) + \frac{16}{2} $
	$= 1 \left[\frac{32}{32} \sin(\frac{n\pi}{2}) \right]$
	2 [27]
·	$= \frac{16}{n^2\pi^2} \sin\left(\frac{n\pi}{2}\right)$
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2 2 2 2	
	$f(nx) = \sum_{n=1}^{\infty} \frac{16}{n^2 \pi^2} \sin\left(\frac{n\pi}{2}\right) \sin\left(\frac{n\pi}{4}\right)$
4)	Exic Obtain half-range cosine series for $f(x)=x(2-x)$ in $0 < x < 2$.
5>	Find half range casine series for the function. f(x)=1-x; 0 <x<11< td=""></x<11<>
6)	Hence deduce that, $\Pi = \frac{\Pi - x}{4(\frac{\Pi - x}{2})} = \frac{(050)x}{1^2} + \frac{(050)x}{3^2} + \frac{(050)x}{5^2} + \frac{(050)x}{5^2} + \frac{(050)x}{5^3} + (05$
7)	Ex:- Obtain half range cosine series $f(x) = x$ (0,2) Le prove that $\frac{114}{36} - \frac{1}{14} + \frac{1}{34} + \frac{1}{54} + \cdots$ $\frac{114}{90} = \frac{1}{14} + \frac{1}{24} + \frac{1}{34} + \cdots$
(8	Obtain half range sine series of far)= > x 0 <x<11 2<="" td=""></x<11>
	and deduce $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \cdots$ Prof. Nancy Sinollin
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17 12 17 17	
ما	Ex: Obtain half range cosine series of $f(x) = x(\Pi - x)$ in $(0,\Pi)$. Hence deduce that, $= \frac{\Pi^2}{6}$
9>	Exi-
	Obtain half range rosine several
	i ca II) Hence deduce that,
	$\frac{1}{1} \frac{1}{1} \frac{1}$
	22 02
	$\frac{1}{n-1}$ $\frac{n^2}{n^2}$ 6 $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{3}$
	<u> </u>
	$ u \int_{0}^{\infty} \frac{(-1)^{n+1}}{12} = \frac{1}{12} = \frac{1}{12} = \frac{1}{3^2} = \frac{1}{12}$
	1// 19
	- 1.
	$ \tilde{w} \sum_{i=1}^{\infty} \frac{1}{i} = \frac{\pi^4}{1}$
	n=1 $n=90$
	[12]
1	
- 1	
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