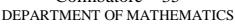
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HALF RANGE SINE AND COSINE SERIES

Half Range Expansions.

In many Engineering problems it is required to expand a Function francision francis in the range (0,717) in a Fourier series of period 271 or in the range (0,1) in a fourier series of period al.

The half range cosine Beries in (0,2) is

$$f(x) = \frac{\alpha_0}{\alpha} + \frac{\beta_0}{n-1} an \cos\left(\frac{n\pi x}{2}\right)$$

where
$$a_0 = \frac{2}{2} \int f(x) dx$$

$$a_n = \frac{2}{l} \int f(x) \cos\left(\frac{n\pi x}{l}\right) dx$$

The half -range sine series is

$$f(\alpha) = \int_{n=1}^{\infty} b_n \sin\left(\frac{n\pi x}{\ell}\right)$$

to here
$$b_n = 2 \int f(x) \sin n\pi x dx$$

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HALF RANGE SINE AND COSINE SERIES

obtain the fourier expansion of xsina as a cosine series in 10,710 a

The Fourier cosure series of fras co (0, T) is

$$f(x) = \frac{ao}{2} + \frac{ao}{n=1} an cas na$$

To find ao! -

$$a_0 = \frac{2}{\pi} \int_{0}^{\pi} a \sin x \, dx$$

$$u = x$$

$$u' = 1$$

$$v = Sin x$$

$$v' = -cos x$$

$$v'' = 0$$

$$v'' = -sin x$$

$$=\frac{2}{\pi}\left[-\pi\cos\alpha - (i)\cos\alpha\right]_{0}^{\pi}$$

$$=\frac{2}{\pi}\left[-\pi\cos\pi + 0 + 0 - 0\right]$$

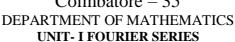
$$=2\left[-\pi\cos\pi\right]$$

$$= -2(-1)$$



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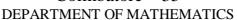
$$\frac{\partial}{\partial x} \int \frac{\partial}{\partial x} \int \frac{\partial$$

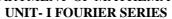
₽ **(X**

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$$= \frac{1}{\pi} \left[-\pi \cos(1+n)\pi - \pi \cos(1-n)\pi \right]$$

$$= \frac{1}{\pi} \left[-\pi \cos(1+n)\pi - \pi \cos(1-n)\pi \right]$$

$$= \frac{1}{\pi} \left[-\pi \cos(1+n)\pi + \cos(1-n)\pi \right]$$

$$= (-1) \left[\cos\pi \cos n\pi + \cos\pi \cos n\pi \right]$$

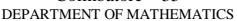
$$= (-1) \cos\pi \cos n\pi - \frac{1}{1+n} + \frac{1}{1-n} \right]$$

$$= (-1) (-1) (-1)^{n} \left[\frac{1}{1+n} + \frac{1}{1-n} \right]$$

$$= (-1)^{n} \left[\frac{1-n^{n}+1+n^{n}}{1-n^{2}} \right]$$

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$$a_1 = \frac{2}{\pi} \int a \sin a \cos a dx$$

$$V = Sind \pi$$
 $V_1 = -cos 2\pi$

$$=\frac{1}{\pi}\left[-2\cos2z - \cos2z\right]^{\pi}$$



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The Fourier losine series is

$$f(\alpha) = \frac{\alpha}{2}0 + \alpha_1 \cos \alpha + \frac{\alpha}{n-2} \cos \alpha = \frac{\alpha}{n-2}$$

$$= \frac{\alpha}{2} + (-\frac{1}{2}) \cos \alpha + \frac{\alpha}{n-2} \frac{\alpha}{1-n^2} \cos \alpha = \frac{\alpha}{n-2} \frac{(-1)^n}{1-n^2} \cos \alpha = \frac{\alpha}{n-2} \frac{(-1)^n}{$$

$$\frac{\pi}{2} = 1 - 2 \int \frac{(-1)^2 \cos \pi}{(2-1)(2+1)} + \frac{(-1)^4 \cos 2\pi}{(4-1)(4+1)}$$

$$-1 - 2 \int \frac{(-1)}{1 \cdot 2} + \frac{1}{3 \cdot 5} - \frac{1}{5 \cdot 7}$$

e X

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