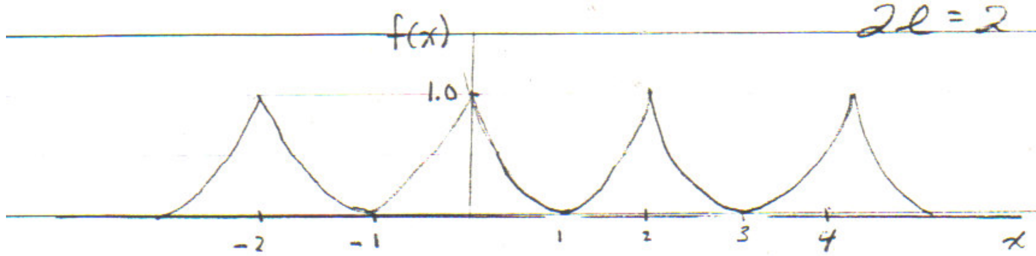
Boas 7-13.14a

$f(x) = (x-1)^2 \quad (0,2)$

$2l = 2 \quad l = 1$



$f(x) = f(-x) \quad \therefore \quad \text{even} \qquad b_n = 0$

$$a_n = \frac{2}{l}\int_0^l f(x)\cos\frac{n\pi x}{l}\,dx = 2\int_0^1 (x-1)^2 \cos n\pi x\,dx$$

$$a_n = 2\int_0^1 (x^2 - 2x + 1)\cos n\pi x\,dx = 2\int_0^1 x^2 \cos n\pi x\,dx - 4\int_0^1 x\cos n\pi x\,dx$$

$$+ 2\int_0^1 \cos n\pi x\,dx$$

$$a_n = \frac{2}{(n\pi)^3}\Big[2(n\pi x)\cos n\pi x + (n^2\pi^2 x^2 - 2)\sin n\pi x\Big]_0^1$$

$$- 4\left[\frac{1}{n^2\pi^2}(\cos n\pi x + n\pi \sin n\pi x)\right]_0^1 + \frac{2}{n\pi}\sin n\pi x\Big|_0^1$$

$$a_n = \frac{2}{(n\pi)^3}\Big[2n\pi(-1)^n + 0 - 0\Big] - 4\left[\frac{1}{(n\pi)^2}\big((-1)^n + 0 - 1\big)\right] + \frac{2}{n\pi}\big[0 - 0\big]$$

$$a_n = \frac{4}{(n\pi)^2}(-1)^n - \frac{4}{(n\pi)^2}(-1)^n + \frac{4}{(n\pi)^2} = \frac{4}{(n\pi)^2}$$

$$a_0 = \frac{2}{1}\int_0^1 (x-1)^2\,dx = \frac{2(x-1)^3}{3}\Big|_0^1 = \frac{2}{3}\left[(0)^3 - (-1)^3\right]$$

$$a_0 = \frac{2}{3}$$

$$\therefore \quad f(x) = \frac{1}{3} + \frac{4}{\pi^2}\sum_{n=1}^{\infty} \frac{\cos n\pi x}{n}$$