Theoretical Physics
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Chapter O Homework. Fourier Series

HW-O1. Orthogonality of the Cosine Functions. Show that

$$\int_{-\pi}^{+\pi} \cos(nx)\cos(mx)dx = \pi\delta_{nm}$$

You must do your integrals using the backward Euler formula as we did in the class notes for the sine case. Then use your above result to show that

$$a_n = \frac{1}{\pi}\int_{-\pi}^{+\pi} f(x)\cos(nx)dx \ .$$

HW-O2. The Ramp or Sawtooth Waveform. Find the Fourier amplitudes for the ramp wave which has an amplitude of 1. Then report your series explicitly showing the first four terms.