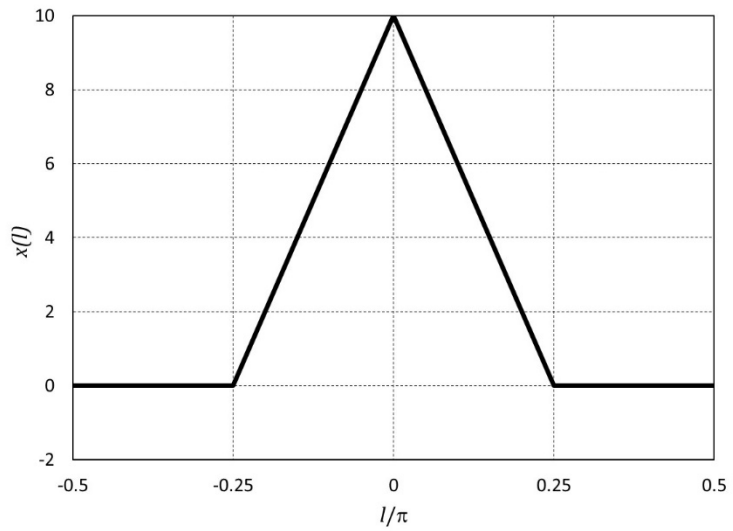
$$x(l) = a_0 + \sum_{n=1}^{n=\infty} a_n \cos(nl) + b_n \sin(nl)$$

$$x(l) \text{ is a continuous periodic function defined between } l = -\frac{\pi}{2} \quad \text{and } l = +\frac{\pi}{2}$$

1. (30 points) Show that $a_0 = 1/\pi \int_{-\pi/2}^{\pi/2} x(l)dl$.

2. (40 points) Show that $a_n = 2/\pi \int_{-\pi/2}^{\pi/2} x(l)\cos(nl)dl$.
   Hint: Multiply both sides by $\cos(ml)$ and apply a trigonometric identity before integrating.

3. (30 points) Evaluate a_2 for



Potentially useful information:

$$\sin\alpha\cos\beta = \frac{\sin(\alpha+\beta)+\sin(\alpha-\beta)}{2}$$

$$\cos\alpha\cos\beta = \frac{\cos(\alpha+\beta)+\cos(\alpha-\beta)}{2}$$

$$\sin\alpha\sin\beta = \frac{\cos(\alpha-\beta)-\cos(\alpha+\beta)}{2}$$

$$\int (x\sin bx)dx = \frac{\sin bx}{b^2} - \frac{x\cos bx}{b}$$

$$\int (x\cos bx)dx = \frac{\cos bx}{b^2} + \frac{x\sin bx}{b}$$