PROBLEM:

A signal $x(t)$ is periodic with period $T_0 = 8$. Therefore it can be represented as a Fourier series of the form

$$x(t) = \sum_{k=-\infty}^{\infty} a_k e^{j(2\pi/8)kt}.$$

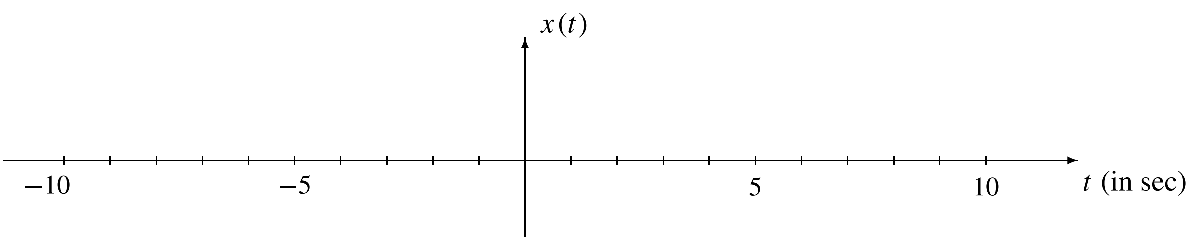
It is known that the Fourier series coefficients for this representation of a particular signal $x(t)$ are given by the integral

$$a_k = \frac{1}{8}\int_{0}^{5} (5-t)e^{-j(2\pi/8)kt}\,dt. \qquad (1)$$

NOTE: Parts (c) and (d) can be worked independently of parts (a) and (b).

(a) In the expression for a_k in Equation (1) above, the integral and its limits define the signal $x(t)$. Determine an equation for $x(t)$ that is valid over one period.

(b) Using your result from part (a), draw a plot of $x(t)$ over the range $-10 \le t \le 10$ seconds. Label it carefully.



(c) Which value of k in Equation (1) gives the DC (or average) value of $x(t)$? $k =$

(d) Determine the DC value of $x(t)$.