

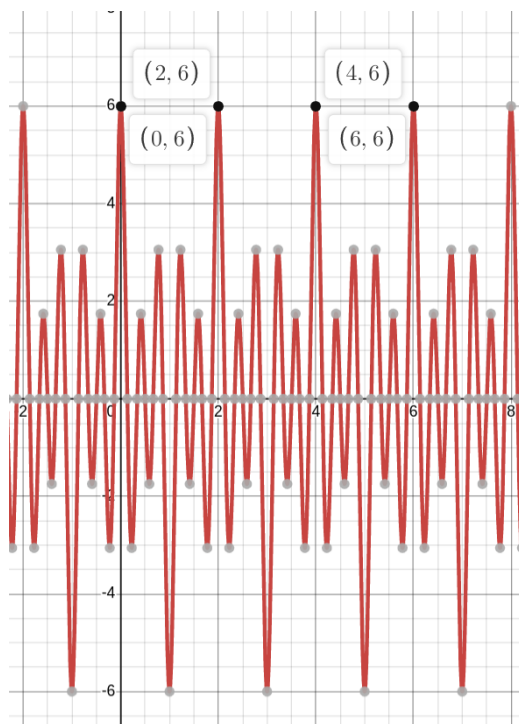
HW 13

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1.

a) $f(t) = \cos(\pi t) + 2\cos(3\pi t) + 3\cos(5\pi t)$

Yes this is periodic! $T = 2$

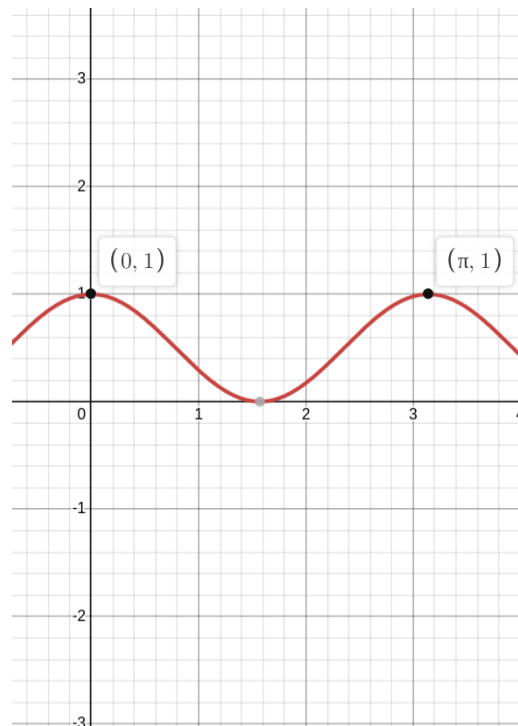


b) $y(t) = \sin(t) + 4\cos(2\pi t)$

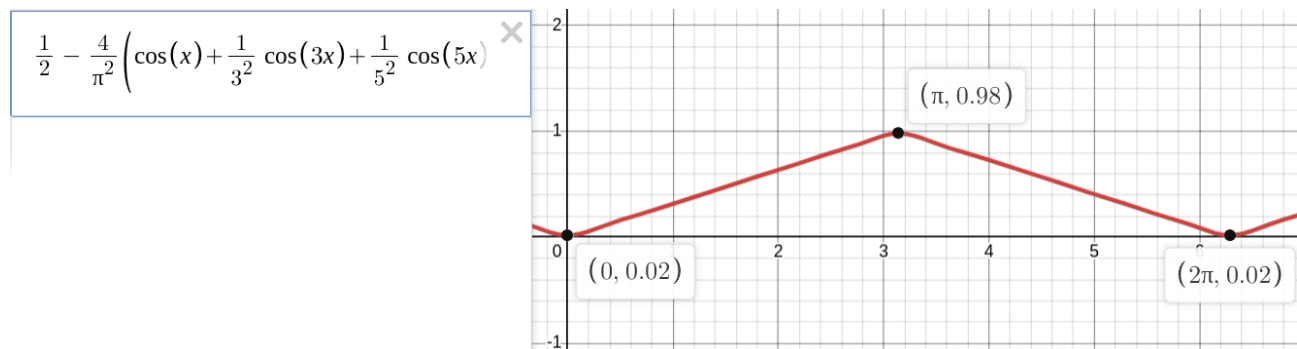
No, in order for two functions to be sum to another periodic function the periods of the two functions must be multiples of each other. The period of $\sin(t)$ is 2π and the period of $\cos(2\pi t)$ is 1.

c) $f(t) = \cos^2(t)$

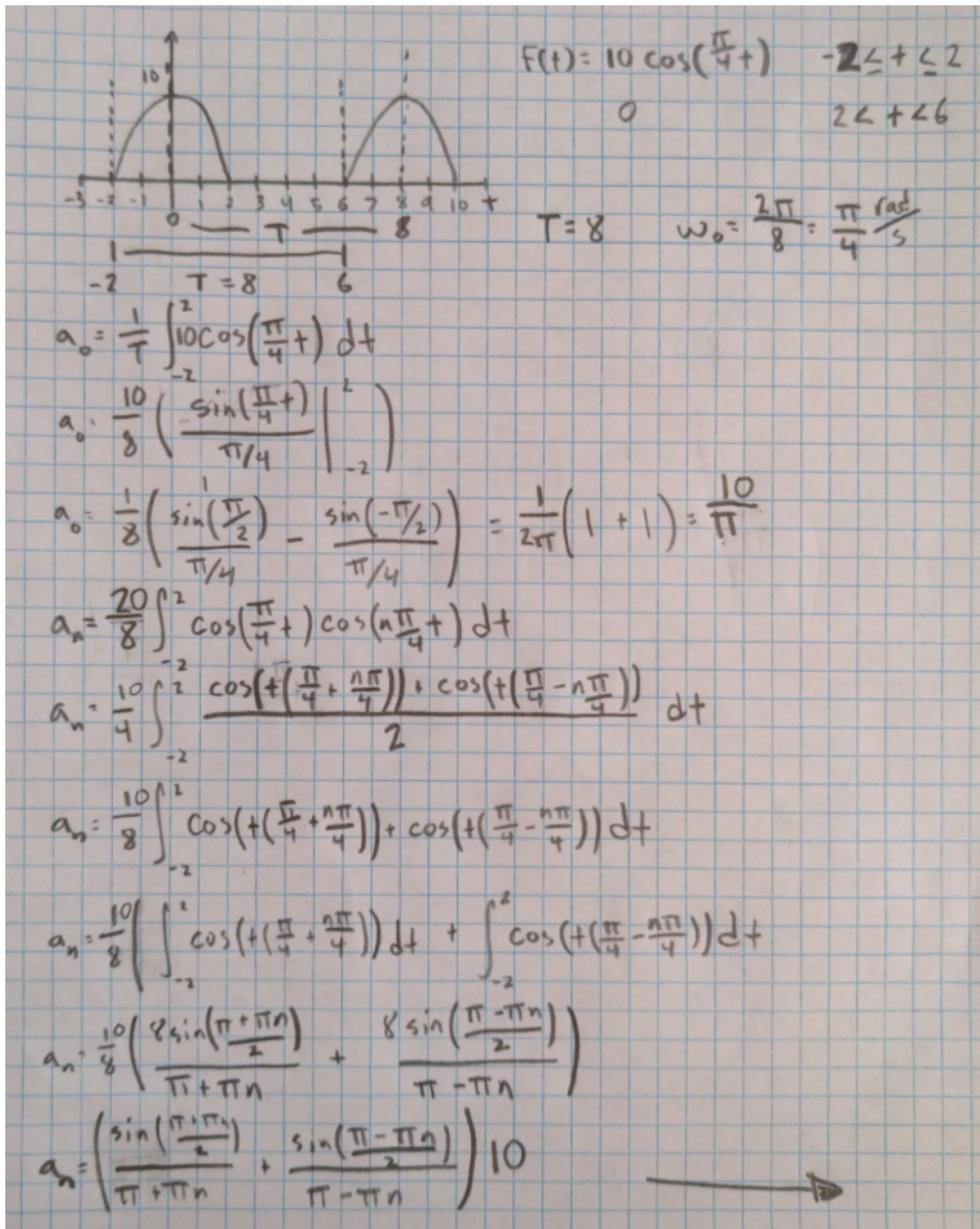
Yes this is periodic! $T = \pi$



2.



3.



cont.

$$b_n = \frac{20}{8} \int_{-2}^2 \underbrace{\cos\left(\frac{\pi}{4}t\right)}_{\beta} \underbrace{\sin\left(n\frac{\pi}{4}t\right)}_{\alpha} dt$$

$$b_n = \frac{10}{4} \int_{-2}^2 \frac{\sin\left(\frac{n\pi}{4}t + \frac{\pi}{4}t\right) + \sin\left(\frac{n\pi}{4}t - \frac{\pi}{4}t\right)}{2} dt$$

$$b_n = \frac{10}{8} \left(\int_{-2}^2 \sin\left(t\left(\frac{n\pi}{4} + \frac{\pi}{4}\right)\right) dt + \int_{-2}^2 \sin\left(t\left(\frac{n\pi}{4} - \frac{\pi}{4}\right)\right) dt \right)$$

$$b_n = \frac{10}{8} (0 + 0) = 0$$

$$F(t) = 10 \left(\frac{1}{\pi} + \sum_{n=1}^{\infty} \left(\frac{\sin\left(\frac{\pi + \pi n}{2}\right)}{\pi + \pi n} + \frac{\sin\left(\frac{\pi - \pi n}{2}\right)}{\pi - \pi n} \right) \cos\left(\frac{n\pi}{4}t\right) \right)$$