$$A_n = \int_{-1}^{0} \cos n\pi t\, dt + \int_{0}^{1} t \cos n\pi t\, dt$$

$$= \tfrac{1}{n\pi} [\sin n\pi t]_{-1}^{0} + \tfrac{1}{n\pi} [t \sin n\pi t]_{0}^{1}$$

$$- \tfrac{1}{n\pi} \int_{0}^{1} \sin n\pi t\, dt$$

$$= 0 + 0 + \tfrac{1}{n^2\pi^2} [\cos n\pi t]_{0}^{1}$$

$$= \begin{cases} 0 & \text{if } n \text{ is even,} \\ -\dfrac{2}{n^2\pi^2} & \text{if } n \text{ is odd,} \end{cases}$$

?

I UNDERSTAND HOW TO GET TO THE NEXT LINE USING INTEGRATION BY PARTS BUT I CANNOT FIGURE OUT HOW TO GET

WHERE DO THE ZEROS COME FROM?