

$$1) \int_{-1}^2 kx^2 dx = \frac{2}{3}$$

$$\Leftrightarrow k \cdot \frac{1}{3} x^3 \bigg|_{-1}^2 = \frac{2}{3}$$

$$\Leftrightarrow \left( k \cdot \frac{1}{3} \cdot 2^3 - k \cdot \frac{1}{3} \cdot (-1)^3 \right) = \frac{2}{3}$$

$$\Leftrightarrow \frac{8}{3} k + \frac{1}{3} k = \frac{2}{3}$$

$$\Leftrightarrow 9k = 2 \quad \Leftrightarrow k = \frac{2}{9}$$

$$2) \int_0^k \sin 2t \, dt = 1$$

$$\Leftrightarrow \frac{1}{2} \int_0^k \sin 2t \cdot 2 \, dt = 1$$

$$\Leftrightarrow \frac{1}{2} \int_0^k \sin 2t \cdot \underbrace{(2t)'} \cdot dt = 1$$

$\begin{matrix} \nearrow \sin \\ -\cos \end{matrix}$ 
 $\begin{matrix} \searrow \cos \\ -\sin \end{matrix}$

$$\Leftrightarrow \frac{1}{2} \left( -\cos 2t \right) \Big|_0^k = 1$$

$$\Leftrightarrow \cos 2t \Big|_0^k = -2$$

$$\Leftrightarrow \cos 2k - \cos 0 = -2$$

$$\Leftrightarrow \cos 2k - 1 = -2$$

$$\Leftrightarrow \cos 2k = -1$$

$$\Leftrightarrow 2k = \pm \arccos(-1) + m \cdot 2\pi$$

$m \in \mathbb{Z}$

$$\Leftrightarrow k = \pm \frac{\pi}{2} + m \cdot \pi$$

$m \in \mathbb{Z}$

$$\Leftrightarrow k = \frac{\pi}{2} + m \cdot \pi$$

↑

$$\frac{\pi}{2} = -\frac{\pi}{2} + 1 \cdot \pi$$