

$$\int_0^{2\pi} \sin m x \sin x dx$$

$$\leftarrow \cos(\alpha+\beta) - \cos(\alpha-\beta) = -2 \sin \alpha \sin \beta \quad \text{511}$$

$$= -\frac{1}{2} \int_0^{2\pi} \{ \cos(m+1)x - \cos(m-1)x \} dx$$

$$\cos 2x = 1 - 2 \sin^2 x$$

$$\sin^2 x = \frac{1 - \cos 2x}{2}$$

• $m \neq 1$ のとき

$$= -\frac{1}{2} \left[\frac{\sin(m+1)x}{m+1} - \frac{\sin(m-1)x}{m-1} \right]_0^{2\pi}$$

$$= -\frac{1}{2} \times 0 = \boxed{0}$$

• $m = 1$ のとき

$$(5式) = \int_0^{2\pi} \sin^2 x dx$$

$$= \int_0^{2\pi} \frac{1 - \cos 2x}{2} dx$$

$$= \frac{1}{2} \left[x - \frac{\sin 2x}{4} \right]_0^{2\pi}$$

$$= \frac{1}{2} \times 2\pi = \boxed{\pi}$$

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$$m = 1 \text{ のとき } \pi$$

$$m \geq 2 \text{ のとき } 0$$