

$$\int_0^{\pi} x \sin x \, dx$$

$$= \int_0^{\pi} x (-\cos x)' \, dx$$

$$= [-x \cos x]_0^{\pi} + \int_0^{\pi} \cos x \, dx$$

$$= -\pi \times (-1) + 0 + [\sin x]_0^{\pi}$$

$$= \boxed{\pi}$$