

Mari khadijah usman 19/  
sci01/063

Mult 104  
1.  $\int x^2 \sin x \, dx$

Solution

$$\int u \, dv = uv - \int v \, du \quad \text{①}$$

For  $\int u \, dv = \int x^2 \sin(x) \, dx$

$$u = x^2 \Rightarrow \frac{du}{dx} = 2x$$
$$du = 2x \, dx$$
$$dv = \sin(x) \, dx$$
$$\int dv = \int \sin(x) \, dx$$
$$v = -\cos(x)$$

Substitute into eqn ①

$$\int x^2 \sin(x) \, dx = -x^2 \cos(x) - \int (+2x \cos(x)) \, dx$$
$$\int x^2 \sin(x) \, dx = -x^2 \cos(x) + 2 \int x \cos(x) \, dx \quad \text{②}$$

$v = x \Rightarrow \frac{dv}{dx} = 1 \Rightarrow dv = dx$

$$dv = \cos(x) \, dx \Rightarrow \int dv = \int \cos(x) \, dx$$
$$v = \sin(x)$$
$$\int x \cos(x) \, dx = x \sin(x) - \int \sin(x) \, dx$$

Since  $\int \sin(x) \, dx = -\cos(x)$ , this becomes

$$\int x \cos(x) \, dx = x \sin(x) + \cos(x) \dots \text{③}$$