

$$\int u \frac{dv}{dx} dx = uv - \int v \frac{du}{dx} dx$$

1/

$$\int x \sin x dx$$

$$u = x \quad \frac{dv}{dx} = \sin x$$

$$\frac{du}{dx} = 1 \quad v = -\cos x$$

$$-x \cos x - \int -\cos x dx$$

$$-x \cos x - -\sin x + c$$

$$-x \cos x + \sin x + c$$

$$\underline{\underline{\sin x - x \cos x + c}}$$

2/

$$\int 2x e^x dx$$

$$u = 2x \quad \frac{dv}{dx} = e^x$$

$$\frac{du}{dx} = 2 \quad v = e^x$$

$$2x e^x - \int 2 e^x dx$$

$$\underline{\underline{2x e^x - 2e^x + c}}$$

3/

$$\int x \sec^2 x dx$$

$$u = x \quad \frac{dv}{dx} = \sec^2 x$$

$$\frac{du}{dx} = 1 \quad v = \tan x$$

$$x \tan x - \int \tan x dx$$

$$x \tan x - \ln |\sec x| + c$$

4/

$$\int x e^{3x} dx$$

$$u = x \quad \frac{dv}{dx} = e^{3x}$$

$$\frac{du}{dx} = 1 \quad v = \frac{1}{3} e^{3x}$$

$$\frac{1}{3} x e^{3x} - \int \frac{1}{3} e^{3x} dx$$

$$\underline{\underline{\frac{1}{3} x e^{3x} - \frac{1}{9} e^{3x} + c}}$$

5/

$$\int_0^{\pi/6} 2x \cos x dx$$

$$u = 2x \quad \frac{dv}{dx} = \cos x$$

$$\frac{du}{dx} = 2 \quad v = \sin x$$

$$\left[ 2x \sin x - \int 2 \sin x dx \right]_0^{\pi/6}$$

$$\left[ 2x \sin x + 2 \cos x \right]_0^{\pi/6}$$

$$\left[ 2\left(\frac{\pi}{6}\right) \sin\left(\frac{\pi}{6}\right) + 2 \cos\left(\frac{\pi}{6}\right) \right] - \left[ 0 + 2 \cos(0) \right]$$

$$\left( \frac{\pi}{6} + \sqrt{3} \right) - 2$$

$$\underline{\underline{\frac{\pi}{6} + \sqrt{3} - 2}}$$

6/

$$\int x^2 e^x dx$$

$$u = x^2 \quad \frac{dv}{dx} = e^x$$

$$\frac{du}{dx} = 2x \quad v = e^x$$

$$x^2 e^x - \int 2x e^x dx$$

$$u = 2x \quad \frac{dv}{dx} = e^x$$

$$\frac{du}{dx} = 2 \quad v = e^x$$

$$x^2 e^x - \left[ 2x e^x - \int 2e^x dx \right]$$

$$\underline{x^2 e^x - 2x e^x + 2e^x + c}$$

7/

$$\int \ln x \, dx$$

$$u = \ln x \quad \frac{dv}{dx} = 1$$

$$\frac{du}{dx} = \frac{1}{x} \quad v = x$$

$$x \ln x - \int 1 \, dx$$

$$\underline{\underline{x \ln x - x + c}}$$

8/

$$\int_1^2 x^2 \ln x \, dx$$

$$u = \ln x \quad \frac{dv}{dx} = x^2$$

$$\frac{du}{dx} = \frac{1}{x} \quad v = \frac{1}{3}x^3$$

$$\left[ \frac{1}{3}x^3 \ln x - \int \frac{1}{3}x^2 \, dx \right]_1^2$$

$$\left[ \frac{1}{3}x^3 \ln x - \frac{1}{9}x^3 \right]_1^2$$

$$\left[ \frac{8}{3} \ln 2 - \frac{8}{9} \right] - \left[ -\frac{1}{9} \right]$$

$$\frac{8}{3} \ln 2 - \frac{7}{9}$$