Integration by parts "reverse product rule"	$\int u \frac{dv}{dx} dx = \underbrace{uv - \int v \frac{du}{dx} dx}$ or $\int u\, dv = uv - \int v\, du$

Find the integral of $\int \underbrace{x}_{u}\, \underbrace{\sin x}_{dv/dx}\, dx = -x \cdot \cos x - \int -\cos x\, dx$

1) make the "u" function the polynomial /

simpler of the 2 options

$$\boxed{= \underbrace{-x}_{u}\, \underbrace{\cos x}_{v} + \sin x + C}$$

$$f'(x) = +x \sin x - 1\cos x + \cos x$$

Integration by parts	$\int u\frac{dv}{dx}dx = uv - \int v\frac{du}{dx}dx$ or $\int u\,dv = uv - \int v\,du$
Find the integral of	$\int \ln x\, dx$

$$= \int \underbrace{1}_{u} \cdot \underbrace{\ln x}_{dv/dx}\, dx$$

lolz

$$= 1 \cdot \int \ln x\, dx - \cancel{\int 0 \cdot \ln x\, dx}$$

$$\int \underbrace{\ln x}_{u} \cdot \underbrace{1}_{\frac{dv}{dx}}\, dx$$

$$\ln(x) \cdot x - \int x \cdot \frac{1}{x}\, dx$$

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

$$\boxed{x \cdot \ln x - x + C}$$

$$x \cdot \frac{1}{x} + 1 \cdot \ln x - 1$$

$$1 + 1 \cdot \ln x - 1$$

Integration by parts	$\int u \frac{dv}{dx} dx = uv - \int v \frac{du}{dx} dx$ or $\int u\, dv = uv - \int v\, du$

Find the integral of $\int \underbrace{e^x}_{u} \underbrace{\cos x}_{dv/dx}\, dx = e^x \cdot \sin x - \int \underbrace{\sin x}_{dv/dx} \cdot \underbrace{e^x}_{u} dx$

$$- e^x \cdot \cos x - \int -\cos x \cdot e^x dx$$

$$\left(- e^x \cdot \cos x + \int e^x \cos x\, dx\right)$$

$$\int e^x \cos x\, dx = e^x \sin x + e^x \cos x - \int e^x \cos x\, dx$$

$$\frac{2\int e^x \cos x\, dx}{2} = \frac{e^x(\sin x + \cos x)}{2} + \int$$

$$\boxed{\int e^x \cos x\, dx = \frac{e^x}{2}(\sin x + \cos x) + C}$$