

If $\int xe^x \cos x dx = ae^x(b(1-x)\sin x + cx \cos x) + d$, then

(a) $a = 1, b = 1, c = -1$

(b) $a = \frac{1}{2}, b = -1, c = 1$

(c) $a = 1, b = -1, c = 1$

(d) $a = \frac{1}{2}, b = 1, c = -1$

$$\begin{aligned} I &= \int xe^x \cos x dx \\ &= xe^x \sin x - \int (xe^x + e^x) \sin x dx \\ &= xe^x \sin x - xe^x(-\cos x) - \int (xe^x + e^x) \\ &= xe^x \sin x + xe^x \cos x - \int xe^x \cos x dx \\ \text{or } 2I &= xe^x(\sin x + \cos x) - e^x \sin x + \\ &= e^x((x-1)\sin x + x \cos x) + d \\ \text{or } I &= \frac{1}{2}e^x((x-1)\sin x + x \cos x) + d \\ a &= \frac{1}{2}, b = -1, c = 1 \end{aligned}$$