Lecture 01: Integrate by parts

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Question 1.

Find the value of A in the expression below. Enter your answer as text.

$$\int x^2 e^x \, dx = x^2 e^x - 2xe^x + Ae^x.$$

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$$\int x^2 e^x \, dx = x^2 e^x - 2xe^x + 2e^x.$$

Thus, $A = 2$.

Question 2.

Find the anti-derivative

$$\int 5x \sin(2x)\, dx.$$

Let $u = 5x$ and $dv = \sin(2x)\, dx$

A $-\frac{5}{2}x\cos(2x) + \frac{5}{4}\sin(2x) + C$
B $\frac{5}{2}x\cos(2x) - \frac{5}{4}\sin(2x) + C$
C $-\frac{5}{2}x\cos(2x) - \frac{5}{4}\sin(2x) + C$
D $\frac{5}{2}x\cos(2x) + \frac{5}{4}\sin(2x) + C$
E None of the above $+C$

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A.

With our choice of u and dv, we have $du = 5dx$ and $v = -\frac{1}{2}\cos(2x)$.
Thus, we obtain

$$\begin{aligned}\int 5x\sin(2x)\,dx &= -\frac{5}{2}x\cos(2x) + \frac{1}{2}\int 5\cos(2x)dx \\ &= -\frac{5}{2}x\cos(2x) + \frac{5}{4}\sin(2x) + C.\end{aligned}$$