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$\boxed{\text{Practice Problems: }}$ Integration, u-substition

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$$\int [(2x+1)e^{x^2+x} - x^2 e^{2x+1}]\, dx$$

PARTS

$\boxed{\text{Step 1}}$ $u = x^2 + x$; $du = 2x+1\, dx$] 1^{st} PC

$$\int e^{x^2+x} \cancel{(2x+1)dx}$$

1^{st} PC Done

$\boxed{\text{Step 2}}$ ~~$w = 2x+1$; $du = 2dx$~~ NO

~~or $u = x^2$; $du = 2x\,dx$~~ NO

$$\int x^2 \quad e^{2x+1}\, dx \quad \text{or} \quad \int e^{2x+1} \quad x^2\, dx$$

, So b/c of extra (x's) use D, I

	D	I
+	x^2	e^{2x+1}
−	$2x$	$\frac{1}{2}e^{2x+1}$
+	2	$\frac{1}{4}e^{2x+1}$
−	$\int \emptyset$	$\frac{1}{8}e^{2x+1}$

$u = 2x+1$
$du = 2dx$

$$= e^{x^2+x} + \frac{1}{2}x^2 e^{2x+1} - 2x \cdot \frac{1}{4}e^{2x+1} + 2 \cdot \frac{1}{8}e^{2x+1} + C$$

$\boxed{\text{step 3}}$ Clean up !!

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$$\int_1^2 \frac{\sqrt{\ln x}}{x}\,dx$$

can be cleaned up by u-substitution

$$\int_1^2 \underline{(\ln x)}^{1/2} \cdot \cancel{\frac{1}{x}dx}$$

u-value

$u = \ln x$

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

✓ perfect match, so $\frac{1}{x}dx$ disappears

$$\int_1^2 \frac{(\ln x)^{1/2+1}}{(1/2+1)} = \ln x^{3/2} \cdot \frac{2}{3}\Bigg|_{x=1}^{x=2}$$

Solve for $x=1$ and $x=2$ to get a final answer.