Calculus II

Integrals of the form $\int \ln(mx)\mathbf{d}x$

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2019

Integration by parts: $\int u\mathrm{d}v = uv - \int v\mathrm{d}u.$

Example

$$\int \ln x\mathrm{d}x \quad =$$

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$$\int \ln x \mathrm{d}x = (\ln x)x - \int x\mathrm{d}(\ln x) \quad \Big| \text{ integrate by parts}$$

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Integration by parts: $\int u\mathrm{d}v = uv - \int v\mathrm{d}u.$

Example

$$\begin{aligned} \int \ln x\mathrm{d}x &= (\ln x)x - \int x\mathrm{d}(\ln x) \quad \Big| \text{ integrate by parts} \\ &= x\ln x - \int x(\ln x)'\mathrm{d}x \end{aligned}$$

Integration by parts: $\int u\mathrm{d}v = uv - \int v\mathrm{d}u.$

Example

$$\begin{aligned}
\int \ln x\mathrm{d}x &= (\ln x)x - \int x\mathrm{d}(\ln x) \quad \Big| \text{ integrate by parts} \\
&= x\ln x - \int x(\ln x)'\mathrm{d}x \\
&= x\ln x - \int x\textbf{?}\ \mathrm{d}x
\end{aligned}$$

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&= x\ln x - \int x(\ln x)'\mathrm{d}x \\
&= x\ln x - \int x\frac{1}{x}\mathrm{d}x
\end{aligned}$$

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\int \ln x\mathrm{d}x &= (\ln x)x - \int x\mathrm{d}(\ln x) \quad \Big| \text{ integrate by parts} \\
&= x\ln x - \int x(\ln x)'\mathrm{d}x \\
&= x\ln x - \int x\frac{1}{x}\mathrm{d}x \\
&= x\ln x - \int \mathrm{d}x \\
&= x\ln x - x + C \quad .
\end{aligned}$$