PP44738

MIHÁLY BENCZE - ROMANIA

Compute:

$$\int e^{-x}\Big(\frac{1}{\sin^2 x} + \ln(\sin x)\Big)dx$$

Solution by Daniel Sitaru and Claudia Nănuţi.

$$\int e^{-x}\Big(\frac{1}{\sin^2 x} + \ln(\sin x)\Big)dx =$$

$$= \int e^{-x}\cdot\frac{1}{\sin^2 x}dx + \int e^{-x}\ln(\sin x)dx =$$

$$= -\int e^{-x}(\cot x)'dx - \int (e^{-x})'\ln(\sin x)dx =$$

$$= -\Big(e^{-x}\cot x + \int e^{-x}\cot x\,dx\Big) - \Big(e^{-x}\ln(\sin x) - \int e^{-x}\cdot\frac{\cos x}{\sin x}dx\Big) =$$

$$= -\frac{\cot x}{e^x} - \int e^{-x}\cot x\,dx - \frac{\ln(\sin x)}{e^x} + \int e^{-x}\cot x\,dx =$$

$$= -\frac{\cot x + \ln(\sin x)}{e^x} + C$$

$\square$

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