$$\begin{aligned}\int e^{2\,x}\,\mathrm{s\,i\,n}\,3\;x\;\;d\;x\;\;&=\int \mathfrak{I}\;e^{(\;2\,+\,3\;i\;)\;x}\;\;d\;x\\&=\mathfrak{I}\int e^{(\;2\,+\,3\;i\;)\;x}\;\;d\;x\\&=\mathfrak{I}\left(\quad\frac{1}{2+3\;i}\;e^{(\;2\,+\,3\;i\;)}\;\right)\end{aligned}$$

From this we see that $f(n)=0$.