

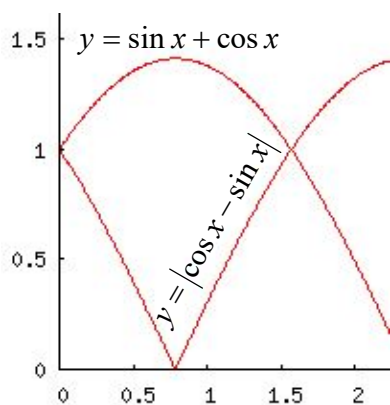
Only one option is correct.

The area enclosed by the curves $y = \sin x + \cos x$ and $y = |\cos x - \sin x|$ over the interval $\left[0, \frac{\pi}{2}\right]$ is

- (A) $4(\sqrt{2}-1)$ (B) $2\sqrt{2}(\sqrt{2}-1)$ (C) $2(\sqrt{2}+1)$ (D) $2\sqrt{2}(\sqrt{2}+1)$

[JEE Advanced 2013]

Solution



The required area,

$$\begin{aligned}
 &= \int_0^{\pi/2} [\sin x + \cos x - (|\cos x - \sin x|)] dx \\
 &= \int_0^{\pi/4} [\sin x + \cos x - (\cos x - \sin x)] dx + \int_{\pi/4}^{\pi/2} [\sin x + \cos x - (\sin x - \cos x)] dx \\
 &= \int_0^{\pi/4} 2 \sin x dx + \int_{\pi/4}^{\pi/2} 2 \cos x dx \\
 &= -2 \cos x \Big|_0^{\pi/4} + 2 \sin x \Big|_{\pi/4}^{\pi/2} \\
 &= -2 \left(\frac{1}{\sqrt{2}} - 1 \right) + 2 \left(1 - \frac{1}{\sqrt{2}} \right) \\
 &= 4 - \frac{4}{\sqrt{2}} = 2\sqrt{2}(\sqrt{2}-1)
 \end{aligned}$$

Hence, (B).