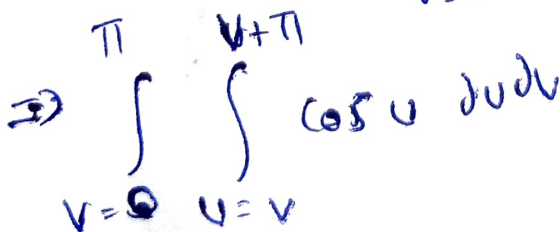


$$|5| = 1$$

$$\begin{aligned} y = v = 0 \\ y = v = \pi \end{aligned} \Rightarrow \boxed{0 \leq v \leq \pi}$$

at $x = \pi$
 $v = v - \pi$



$$\int_0^\pi [\sin v]_v^{v+\pi} dv$$

$$\Rightarrow \int_{-\pi/2}^{\pi} -\sin v - \sin v \, dv$$

$$\Rightarrow -2 [-\cos v]_0^{\pi}$$

$$\Rightarrow 2[-1-1] = \boxed{-4} \text{ h}$$