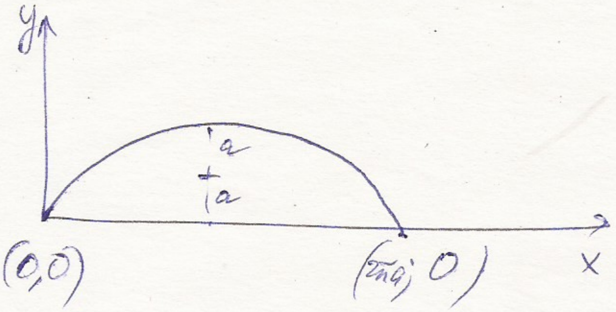

$a = 1.$

$t_1 \begin{cases} 0 = t - \sin t \\ 0 = 1 - \cos t \end{cases} \quad \begin{cases} \sin t = t \\ \cos t = 1 \end{cases} \Rightarrow t_1 = 0$

$t_2 \begin{cases} 2\pi = t - \sin t \\ 0 = 1 - \cos t \end{cases} \Rightarrow t_2 = 2\pi$

$$S_x = 2\pi \int_0^{2\pi} \underbrace{(1-\cos t)}_{2\sin^2\frac{t}{2}} \cdot \sqrt{4\sin^2\frac{t}{2}}\, dt = 2\pi \int_0^{2\pi} 2\sin^2\frac{t}{2} \cdot 2\sin\frac{t}{2}\, dt =$$

$$= 8\pi(-2) \int_0^{2\pi} \left(1 - \cos^2\frac{t}{2}\right) d\cos\frac{t}{2} = -16\pi \left[\int_0^{2\pi} d\cos\frac{t}{2} - \frac{\cos^3\frac{t}{2}}{3}\Bigg|_0^{2\pi} \right] =$$

$$= -16\pi \left[\cos\frac{t}{2}\Bigg|_0^{2\pi} - \frac{1}{3}[-1-1] \right] = -16\pi\left([\cos\pi - \cos 0] + \frac{2}{3} \right)$$

$$= -16\pi \left[-2 + \frac{2}{3} \right] = 16\pi \cdot \frac{4}{3} = \frac{64\pi}{3} \text{ (кв. ед.)}$$

$$-\frac{6}{3} + \frac{2}{3}$$

Ответ: $\frac{64}{3}\pi$ (кв. ед.)