$y = \sin 2x$

$y' = 2\cos 2x$

$1 + y'^2 = 1 + 4\cos^2 2x$

$$S_x = 2\pi \int_0^{\frac{\pi}{2}} \sqrt{1+4\cos^2 2x} \cdot \sin 2x \, dx = 2\pi\left(-\frac{1}{2}\right)\int_0^{\frac{\pi}{2}} \sqrt{1+4\cos^2 2x}\, d\cos 2x =$$

$$= -\pi \int_0^{\frac{\pi}{2}} \sqrt{1+4\cos^2 2x}\, d\cos 2x = \left\{ \begin{array}{l} u = \cos 2x, \ x = \frac{\arccos x}{2} \\ x = 0 \Rightarrow u = \cos 0 = 1 \\ x = \frac{\pi}{2} \Rightarrow u = \cos\frac{\pi}{2} = 0 \end{array} \right\} =$$

$$= -\pi \int_1^0 \sqrt{1+4t^2}\, dt = \left\{ \begin{array}{l|l} u = \sqrt{1+4t^2} & du = \frac{4t}{\sqrt{1+4t^2}}\, dt \\ dv = dt & v = t \end{array} \right\} =$$

по частям

$$= t\sqrt{1+4t^2} - 4\int \frac{t^2}{\sqrt{1+4t^2}}\, dt = t\sqrt{1+4t^2} - \int \frac{(4t^2+1)-1}{\sqrt{1+4t^2}}\, dt =$$

$$= t\sqrt{1+4t^2} + \int \frac{dt}{\sqrt{1+4t^2}} - \int \sqrt{1+4t^2} = t\sqrt{1+4t^2} - \int \sqrt{1+4t^2}\, dt +$$

$$+ \frac{1}{2}\int \frac{dt}{\sqrt{\frac{1}{4}+t^2}} = t\sqrt{1+4t^2} - \int \sqrt{1+4t^2}\, dt + \frac{1}{2}\ln\left|t + \sqrt{\frac{1}{4}+t^2}\right|$$

$a = \frac{1}{2}$

$$\int \sqrt{1+4t^2}\, dt = \frac{t}{2}\sqrt{1+4t^2} + \frac{1}{4}\ln\left|t + \sqrt{\frac{1}{4}+t^2}\right|$$

$$\int_0^1 \sqrt{1+4t^2}\, dt = \frac{t}{2}\sqrt{1+4t^2}\Big|_0^1 + \frac{1}{4}\ln\left|t + \sqrt{\frac{1}{4}+t^2}\right|\Big|_0^1$$