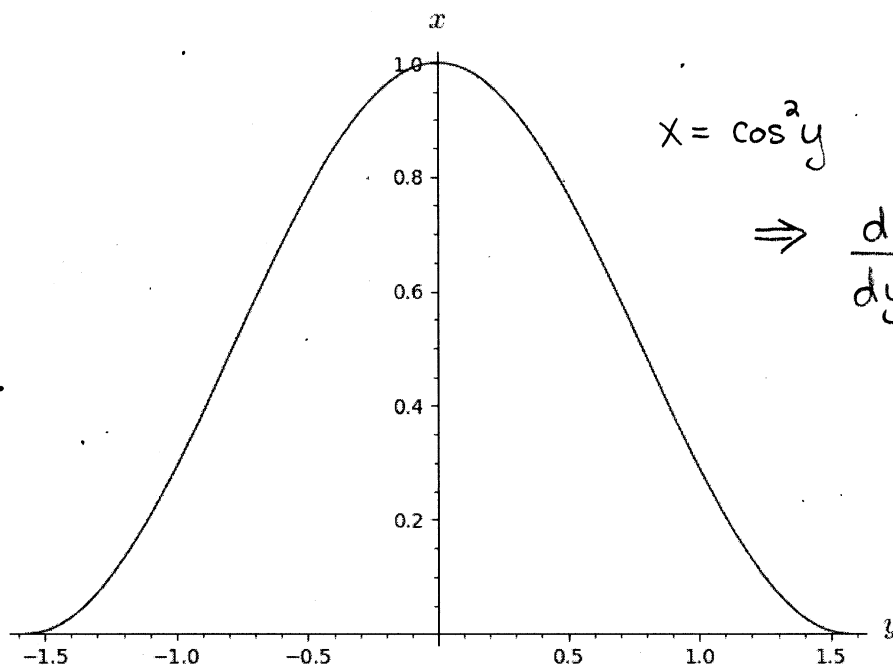


## Example

Find the length of the graph of  $x = \cos^2 y$  over the interval from  $y = -\pi/2$  to  $y = \pi/2$ . Use technology to evaluate your definite integral.

### Solution

In this problem, the independent variable is  $y$ . Therefore, I will place the  $y$ -axis horizontally and the  $x$ -axis vertically. An alternative approach is to rename the variables  $x \leftrightarrow y$ .



$$x = \cos^2 y$$

$$\Rightarrow \frac{dx}{dy} = -2 \cos y \sin y$$

$$\begin{aligned} \text{Arc Length} &= \int_{-\pi/2}^{\pi/2} \sqrt{1 + (-2 \cos y \sin y)^2} dy \\ &= \int_{-\pi/2}^{\pi/2} \sqrt{1 + 4 \cos^2 y \sin^2 y} dy \end{aligned}$$

TI-83/84 ...

$$\text{fnInt}(\sqrt{1 + 4 * \cos(Y)^2 * \sin(Y)^2}, Y, -\pi/2, \pi/2)$$

$$\approx 3.8202$$

Sage ...

var("y")

$$\text{numerical\_integral}(\text{sqrt}(1 + 4 * \cos(y)^2 * \sin(y)^2), -\pi/2, \pi/2) \approx 3.8202$$