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$$\int_{0}^{2\pi} |\sin(x)| dx$$

1) $\sin(x)$ is already positive between 0 and π , so drop the bars, and integrate.

$$\int_{0}^{\pi} \sin(x) \, dx = -\cos(x) \qquad \begin{vmatrix} \pi \\ 0 \end{vmatrix} = -\cos(\pi) - (-\cos(0)) = -(-1) + (1) = 1 + 1 = 2$$

2) Between π and 2π , $\sin(x)$ is negative, so drop the bars, and multiply by -1. This has the effect of taking the absolute value of $\sin(x)$, as shown below. Now we integrate. As you can see, the second bulge is flipped up.



3) Now you can add the two, so the final result is 4.