Integral of $\sin(x) + \cos(x)$

Consider the following integral:

$$\int_0^{\pi} \sin(x) + \cos(x)\, dx.$$

a) Use what you have learned about definite integrals to guess the value of this integral.

b) Find antiderivatives of $\cos(x)$ and $\sin(x)$. Check your work.

c) Use the addition property of integrals to compute the value of:

$$\int_0^{\pi} \sin(x) + \cos(x)\, dx.$$

Check your work by comparing to your answer from part a.

7/8/25

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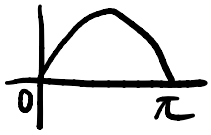
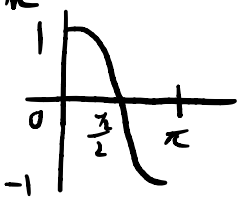
a) $\sin x$ is positive from $x=0$ to $x=\pi$



$\cos x$ is symmetric with positive and negative values from $x=0$ to $x=\pi$



$\Rightarrow$ Area under $\cos x$ cancels out

$\Rightarrow \int_0^{\pi} \sin x + \cos x\, dx = \int_0^{\pi} \sin x\, dx$

b) $F'(x) = \cos x \quad G'(x) = \sin x$

$\int F'(x)\,dx \qquad \int G'(x)\,dx$

$= \sin x + C \qquad = -\cos x + C$

c) $\int_0^{\pi} \sin x + \cos x\, dx = \int_0^{\pi} \sin x\, dx + \int_0^{\pi} \cos x\, dx$

$\therefore$ same as part a).

$= -\cos x \Big|_0^{\pi} + \sin x \Big|_0^{\pi}$

$= -(-1-1) + 0$

$= 2$