

3. (2 points) What is the average value of the function  $f(x) = \sin(x) \cos(x)$  over the interval  $[0, \frac{\pi}{2}]$ ?

$$\begin{aligned} F_{\text{ave}} &= \frac{1}{\frac{\pi}{2} - 0} \int_0^{\pi/2} \sin x \cos x dx && u = \sin x \\ & && du = \cos x dx \\ &= \frac{1}{\frac{\pi}{2}} \int_0^1 u du \\ &= \frac{2}{\pi} \left[ \frac{1}{2} u^2 \right]_0^1 \\ &= \frac{2}{\pi} \left( \frac{1}{2} \right) \\ &= \frac{1}{\pi} \end{aligned}$$