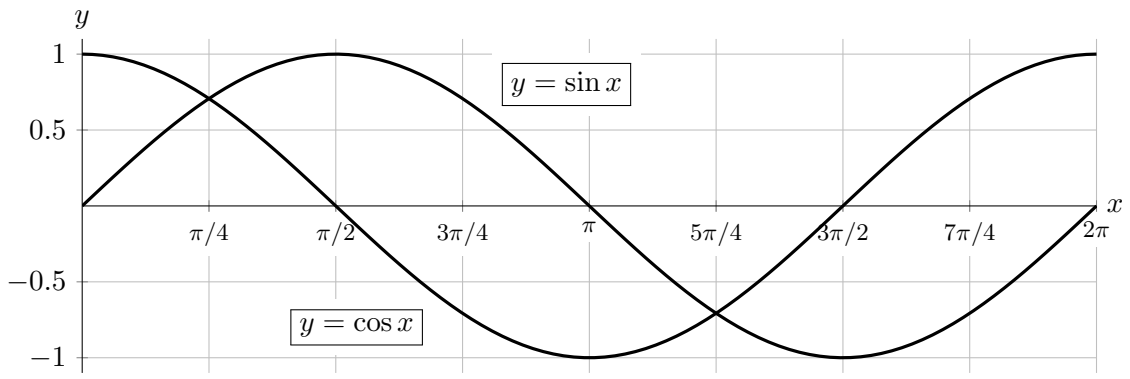
3. [9 points] Throughout this problem, let $f(x) = \sin x + \cos x$. For reference, you may use the graphs of sine and cosine given below, but note that neither of these is a graph of f, since f is their *sum*.



a. [1 point] Give a formula for the derivative of $f(x)$.

Answer: $f'(x) =$ _____

b. [2 points] On which of the following intervals is $f(x)$ increasing? Circle all correct answers.

$\left(0, \frac{\pi}{4}\right)$ $\left(\frac{3\pi}{4}, \frac{5\pi}{4}\right)$ $\left(\frac{5\pi}{4}, \frac{7\pi}{4}\right)$ $\left(\frac{7\pi}{4}, 2\pi\right)$ NONE OF THESE

c. [2 points] On which of the following intervals is $f(x)$ concave down? Circle all correct answers.

$\left(0, \frac{\pi}{4}\right)$ $\left(\frac{3\pi}{4}, \frac{5\pi}{4}\right)$ $\left(\frac{5\pi}{4}, \frac{7\pi}{4}\right)$ $\left(\frac{7\pi}{4}, 2\pi\right)$ NONE OF THESE

d. [4 points] Find and classify all local extrema of $f(x)$ on the interval $(0, 2\pi)$. If there are none of a particular type, write NONE. Use calculus to find and justify your answers, and show all your work.

Answer: Local min(s) at $x =$ _____ and Local max(es) at $x =$ _____