1. (3 pts) Let \( f(x) = \sum_{n=0}^{\infty} \frac{\sin(n)}{n+1} (x - \frac{\pi}{2})^{n+1} \). Show that \( f \) has a local minimum at \( x = \frac{\pi}{2} \).

Find \( f'(\frac{\pi}{2}) \) and find \( f''(\frac{\pi}{2}) \).
2 (2pts) Let \( C(t) = (\cos^2 t + \cos t, \sin t \cos t + \sin t) \). Determine whether \( C(t) \) has a horizontal tangent line, vertical tangent line, or neither a horizontal tangent line nor a vertical tangent line at \( t = \pi \).