(1) No books and notes are allowed.
(2) You may use a calculator and a notecard.
(3) Show your work in details.
(4) Be sure to spell your TA’s name correctly.
(5) Have a nice Thanksgiving.
(1) (15 points) Find the tangent line of the curve
\[ 2 \cos x \sin y = 1 \]
at the point \((\pi/4, \pi/4)\).
(2) (10 points) Let \( f(x) = \tan x \). Find \( f'''(\pi/4) \).
(3) (30 points) Find the derivatives of the following functions.

(a) (10 points) $f(x) = \frac{\sin x}{x}$.

(b) (10 points) $f(x) = \sqrt{x + \sqrt{x + \sqrt{x}}}$.

(c) (10 points) $f(x) = (\cos x)^x$. 
(4) (15 points) Let \( f(x) \) be a function that is twice-differentiable at 0 and let \( F(x) = [f(x)]^{-1} \). Suppose that \( f(0) = 1 \), \( f'(0) = 2 \) and \( f''(0) = 3 \). Find \( F''(0) \).
(5) (10 points) Find the limit

\[
\lim_{x \to 0} \frac{\sin 3x}{\sin 2x}.
\]
(6) (20 points) At noon, ship A is 150 km west of ship B. Ship A is sailing east at 35 km/h and ship B is sailing north at 25 km/h. How fast is the distance between the ships changing at 4:00 P.M.?