4. [13 points] Let \( f(x) = e^{\sin \sqrt{x}} \). Let \( P \) be the point on the graph of \( f \) at which \( x = 4\pi^2 (\approx 39.4784) \).

a. [3 points] Calculate \( f'(x) \).

b. [4 points] Find an exact formula for the tangent line \( L(x) \) to \( f(x) \) at \( P \). Exact means your answer should not involve any decimal approximations.

c. [2 points] Use your formula for \( L(x) \) to approximate \( e^{\sin \sqrt{38}} \).

d. [4 points] Recall that the error, \( E(x) \), is the actual value of the function minus the value approximated by the tangent line. Given the fact that in this case \( E(39) \approx 0.000613 \) and \( E(40) \approx 0.000719 \), would you expect \( f''(4\pi^2) \) to be positive or negative? Explain, without doing any calculations.