4. (15 points) (a) Given that \( g(x) = f(e^{-x}) \), where \( f \) is a function with \( f'(1) = 3 \) and \( f''(1) = -5 \), compute \( g'(0) \) and \( g''(0) \).

\[
\text{ANSWERS:} \quad g'(0) = \underline{\phantom{0}}, \quad g''(0) = \underline{\phantom{0}}
\]

(b) Show that the point \( x = 1, y = \pi/4 \) lies on the curve

\[
2 + xy = \frac{\pi}{4} + x^2 + \tan(y)
\]

and calculate \( dy/dx \) at this point.

(c) The cost function \( C(q) \) represents the cost in dollars of producing \( q \) units of some good and the revenue function \( R(q) \) represents the revenue in dollars received by selling \( q \) units of the good. If \( C'(500) = 100 \) and \( R'(500) = 125 \), should the quantity produced be increased or decreased from \( q = 500 \) in order to increase profits? Explain the reason for your answer.