Short Practice Test for Exam 3

Please show your work. Each numbered problem is worth 10 points.

Problem 1  (40 pts) Find $dy/dx$ for each of the following:

a) $y = 1 + x + x^2 + x^3$

b) $y = (1 + x^2)^{99}$

c) $y = x \sin x$

d) $y = \ln x / \cos x$
e) \( y = \sin^{-1}(5x) \)

f) \( y^2 = e^{x^2} + 2x \)

g) \( y = 3x^2 \)

h) \( y = \sqrt{\log_4 x + 1} \)

i) \( x^y = y^x \)

j) \( y = \ln(e^x \sec x) \)
Problem 2  (10 pts) Re-solve problem 1a, above, using the definition of the derivative (DO NOT USE ANY DIFFERENTIATION RULES.)

Problem 3  (20 points) Please mark each statement as T if it is necessarily true. Otherwise, mark it as F, and correct it so that it becomes true.

T  F  If \( f(x) \) is a continuous function on a closed interval \([a, b]\), then \( f(x) \) assumes both a global maximum and a global minimum on \([a, b]\).

T  F  If a function \( f(x) \) is continuous on \([a, b]\) and has an extreme value at some point \( c \in [a, b] \), then either \( f'(c) = 0 \) or \( f'(c) \) does not exist.

Problem 4  (10 pts) Find the tangent line to the graph of the equation \( 2^x + y = x + 3y \) at the point \((1, 1)\).