Name ____________________________________________

• No calculators allowed.
• Show sufficient work to justify each answer.
• You have 15 minutes for this quiz.

1. (2 pts each) Find \( \frac{dy}{dx} \).

   (a) \( f(x) = (x^5 + x + 1)(x^{10} + 2x^3 + 4) \)

   \[
   f'(x) = (5x^4 + 1)(x^{10} + 2x^3 + 4) + (x^5 + x + 1)(10x^9 + 6x^2)
   \]

   (b) \( f(x) = \frac{1}{x} + x^2 e^x \)

   \[
   f'(x) = -x^{-2} + 2xe^x + x^2 e^x
   \]
2. (3pts) Let \( f(w) = \frac{w^3 + w + 1}{(w-1)^2} \). Find the equation of the tangent line to the curve \( y = f(w) \) at the point \((0,1)\).

\[
(w-1)^2 = w^2 - 2w - 1
\]

\[
f'(w) = \frac{(3w^2 + 1)(w-1)^2 - (w^3 + w + 1)(2w - 2)}{(w-1)^4}
\]

\[
f'(1) = \frac{(1)(-1)^2 - (1)(-2)}{(-1)^4} = \frac{1 + 2}{1} = 3
\]

\[y - 1 = 3(x - 0), \quad y = 3x + 1\]

3. (3pts) Let \( f(x) = 100x^{13}e^{x^1} \). Find \( f'(x) \) and \( f''(x) \).

\[
f'(x) = 100 \left( 13x^{12}e^{x+1} + x^{13}e^{x+1} \right)
\]

\[
f''(x) = 100 \left( 13 \cdot 12 \cdot x^{11} + 13x^{12}e^{x+1} + 13x^{12}e^{x+1} \right)
\]