Name: _____

- There are 12 points possible on this proficiency, one point per problem. **No partial credit will be given.**

- You have one hour to complete this proficiency.

- No aids (book, calculator, etc.) are permitted.

- You do **not** need to simplify your expressions.

- You must show sufficient work to justify your final expression. A correct answer for a nontrivial computation with no supporting work will be marked as incorrect.

- Your final answers **must start with** $f'(x) =$, $\frac{dy}{dx} =$, or similar.

- $\boxed{\textbf{Draw a box around your final answer.}}$

1. **[12 points]** Compute the derivatives of the following functions.

   a. $f(t) = (\pi - t^5)\sin(t)$

   b. $f(x) = \dfrac{\ln(x)}{e^x}$

   c. $g(z) = (z + e^5)(e^2 - z^3)$

d. $r(\alpha) = \ln\left(\alpha^4 - \dfrac{\pi}{4}\right)$

e. $g(y) = \dfrac{y^{5/2} + y^{-1} - \sqrt{5}}{\sqrt{y}}$

f. $F(x) = \sqrt{\dfrac{\ln(5) - x}{2}} - (x+3)^5$

g. $y(t) = \cos\left(5t^2 + \ln(t^3)\right)$

h. $f(x) = \dfrac{4x^a}{3\tan(ax)}$ (where a is a constant)

i. $f(y) = \log_5(y) + \cot\left(y^{-3}\right)$

j. $y = x^{2.7} + \sec^2(3x)\ln(-x)$

k. $g(\theta) = \cos(\theta^2)\arccos(\theta^2)$

l. Compute $\frac{dy}{dx}$ if $\quad x^2 + y^2 = 16 + 3xy^2$. You $\boxed{\text{must}}$ solve for $\frac{dy}{dx}$.