Name: _____ _____ **/ 12**

- There are 12 points possible on this proficiency: one point per problem with no partial credit.
- You have **30** minutes to complete this proficiency.
- No aids (book, calculator, etc.) are permitted.
- Do **not** simplify your expressions.
- **Your final answers should start with** $f'(x) =$**,** $\frac{dy}{dx} =$ or something similar.
- Box your final answer.

Note that this sample derivative proficiency is slightly different from the actual derivative proficiency, because there are a few functions ($\ln(x)$*, inverse trig functions, implicit differentiation in general) that we haven't covered yet.*

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

a. $f(x) = \sqrt[5]{x} + 4x^3 + \dfrac{x - \sqrt{2}}{9}$

b. $y = x^3 \tan(x)$

c. $y = \dfrac{\sec(x)}{1 + e^x}$

d. $y = \sin(ax)e^{bx^2}$ where a and b are fixed constants.

e. $f(x) = \dfrac{\cos(x)}{\sin(x)}$

f. $g(x) = \sqrt{2+\sin^2(6x)}$

g. $y = \tan\left(x^3 \cdot 5^x\right)$

h. $f(z) = \sec(\sqrt{z})$

i. $y = \sin\left(\dfrac{x}{x-3}\right)$

j. $h(x) = \cos\left(e^{\pi x} - (4x)^9\right)$

k. $g(x) = (\sin(x^2 + x))^5$

l. $f(x) = \dfrac{1}{9x}$