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.
- Draw a box around your final answer.
- 1. [12 points] Compute the derivatives of the following functions.

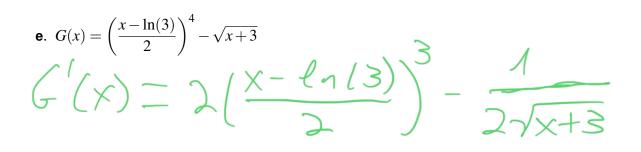
a. $f(t) = e^t (5 - t^3)$ $f'(t) = e^{t}(5-t^{3}) - 3t^{2}e^{t}$

b. $f(x) = \frac{\pi}{\sin x}$ \longrightarrow TTCSC(X) $f'(x) = -\pi(s(x)(ot(x)))$ (quotient rule works too)

c. $r(\theta) = \cot\left(2\sqrt{3} + \theta^5\right)$ $r'(\theta) = -5\theta^4 csc^2 (2 - 13 + \theta^5)$

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d.
$$f(r) = \frac{r^3 + \sqrt{r-8}}{r} = r^2 + r^2 - 8r^2$$

 $f'(r) = 2r - \frac{-3}{2} + 8r^2$
 $r^2 + 8r^2$
 $f'(r) = (3r^2 + \frac{1}{2\sqrt{r}})r - (r^3 + \sqrt{r-8})$
 r^2



f.
$$g(z) = (7-z)(z^3+6) = 7z^3 + 42 - 24 - 62$$

 $g(2z) = 21z^2 - 4z^3 - 6$
(product rule works too)

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g.
$$y(t) = \ln (4t + \sin(t^2))$$

$$y'(t) = \frac{4 + 2t(OS(t^2))}{4t + 5.5n(t^2)}$$

h.
$$y = x^{1/3} + e^{-x}\cos(x)$$

 $\frac{dy}{dx} = \frac{1}{3} \times \frac{-2}{3} - \frac{-2}{6} \cos(x) - e^{-x}\sin(x)$

i. $f(x) = \frac{3 \sec(ax)}{2x^3}$ (where *a* is a constant) $f'(x) = \frac{6ax^3 \sec(ax) \tan(ax) - 18x^3 \sec(ax)}{4x^6}$

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j. $f(y) = 5^y + \tan(y^{-2})$ $(y) = 5^{3} l_{1}(y) - 2y^{-3} sec^{2}(y^{-1})$

k. $g(x) = \arctan(e^{2x})$ $g'(x) = \frac{2e}{1 + 1e^{2x}}$

I. Compute $\frac{dy}{dx}$ if $\ln y - x^2y = 2x + 8$. You must solve for $\frac{dy}{dx}$. $\frac{d}{dx}(l_n(y) - x^2 y) = \frac{d}{dx}(2 \times + 8)$ $\frac{dy}{dx} \cdot \frac{1}{y} - \left(2Xy + x^{2}\frac{dy}{dx}\right) =$ $--x^{-} = z + \lambda xy$ $\frac{y}{x} = \frac{\chi + \chi}{y^{-1} - x^2}$