- There are 12 points possible on this proficiency: One point per problem. No partial credit.
- A passing score is 10/12.
- You have 30 minutes to complete this proficiency.
- No aids (book, calculator, etc.) are permitted.
- You do not need to simplify your expressions.
- Your final answers **must start with** f'(x) = dy/dx =, or similar.
- Circle your final answer.

Compute the derivatives of the following functions.

1.
$$f(x) = \sqrt{x} + \sqrt{6} - \frac{e^x}{3}$$

$$f'(x) = \frac{1}{2}x^{-\frac{1}{2}} - \frac{e^x}{3}$$

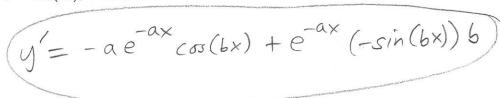
2.
$$f(t) = \frac{1+5t-t^{4/3}}{t} = t^{-1} + 5 - t^{1/3}$$

$$f'(t) = -t^{-2} - \frac{1}{3}t^{-2/3}$$

$$3. \ y = x^2 \sec(x)$$

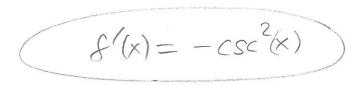
$$\frac{dy}{dx} = 2x \sec(x) + x^2 \sec(x) \tan(x)$$

4. $y = e^{-ax}\cos(bx)$, where a and b are fixed constants



5. $f(x) = \arctan(\sin(5x))$ $f'(x) = \frac{1}{1 + (\sin(5x))^2} \cdot \cos(5x) \cdot 5$

6.
$$f(x) = \frac{\cos(x)}{\sin(x)} = \cot(x)$$



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$$7. \ \ y = \frac{xe^x}{1-x}$$

$$\frac{dy}{dx} = \frac{(1 \cdot e^{x} + x e^{x})(1 - x) - x e^{x}(-1)}{(1 - x)^{2}}$$

8.
$$y = \tan(x + \sqrt{x})$$

$$\frac{dy}{dx} = \sec^2(x+\sqrt{x})\left(1+\frac{1}{2}x^{-\frac{1}{2}}\right)$$

9.
$$f(x) = \sqrt{x} \ln(x) \sin(\pi x)$$

$$f'(x) = \frac{1}{2}x^{-\frac{1}{2}}h(x)\sin(\pi x)$$

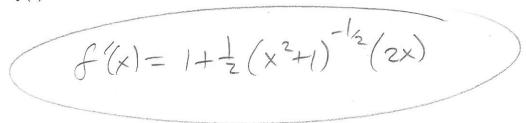
$$+ \sqrt{x} \frac{1}{x}\sin(\pi x)$$

$$+ \sqrt{x} \ln(x)\cos(\pi x)\pi$$

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10. $f(x) = x + \sqrt{x^2 + 1}$



11. $g(t) = \frac{\ln 3}{1 - t^2}$ = $\ln 3$ ($1 - t^2$) $g'(t) = -\ln (3)(1 - t^2)^{-2}(-2t)$

12. Compute dy/dx if $2xy^2 - x^3 + y^5 = 0$. You must solve for dy/dx.

$$2y^{2} + 2x \cdot 2yy' - 3x^{2} + 5y''y' = 0$$

$$y'(4xy+5y'') = -2y^{2} + 3x^{2}$$

$$dy = -2y^{2} + 3x^{2}$$

$$4xy+5y''$$