Name: SOLUTIONS

_____/ 12

- 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 = 0, or similar.
- Circle your final answer.

Compute the derivatives of the following functions.

1.
$$f(x) = \frac{x - \ln 2}{5} - \sqrt[3]{x}$$

$$f'(x) = \frac{1}{5} - \frac{1}{3} \times \frac{-\frac{2}{3}}{3}$$

$$2. g(x) = \frac{1}{\sin(x)} = CSC \times$$

$$Q'(x) = -CSC \times COTX$$

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

$$f'(t) = -t^{-2} + 2t^{-3/2} + 2t$$

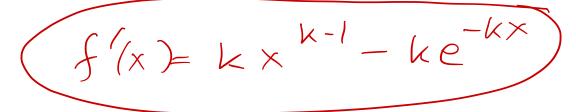
4. $h(x) = e^{-x/4}\cos(x)$

$$(h'(x) = -\frac{1}{4}e^{-x/4}cosx + e^{-x/4}(-sinx))$$

 $5. \ y = \arcsin\left(2x + \sqrt{6}\right)$

$$\frac{dy}{dx} = \frac{1}{\sqrt{1-(2x+\sqrt{6})^2}}$$
 (2)

6. $f(x) = x^k + e^{-kx}$, where k is a fixed constant



7.
$$y = \frac{\tan(x)}{1 + \ln(x)}$$

$$y = \frac{\cot^2(x)}{1 + \ln(x)} + \cot^2(x) = \frac{\cot^2(x)}{1 + \ln(x)} + \cot^2(x) = \frac{\cot^2(x)}{1 + \ln(x)}$$

8.
$$h(x) = \frac{\pi}{x^2} + \left(\frac{x-1}{4}\right)^3 = 77 \times ^{-2} + \left(\frac{1}{4}(x-1)\right)^3$$

$$\left(\left(\frac{1}{4}(x-1) \right)^3 + 3\left(\frac{1}{4}(x-1)\right)^3 + \frac{1}{4} \right)$$

9.
$$y = \sin^2\left(x - \sqrt{x^2 + 1}\right)$$

$$y = 2 \sin(x - \sqrt{x^2 + 1}) \cdot \cos(x - \sqrt{x^2 + 1}) \left(1 - \frac{1}{2}(x^2 + 1) \cdot 2x\right)$$

10. $y = e^x \ln(x) \sec(x)$

$$y' = e^{x} \ln x \operatorname{Sec}(x) + e^{x} \cdot \frac{1}{x} \cdot \operatorname{Sec}(x)$$

$$+ e^{x} \ln(x) \cdot \operatorname{Sec}(x) \tan(x)$$

11.
$$g(x) = \frac{\cos(2x)}{x^3 + x}$$

$$-2\sin(2x) \cdot (x^3 + x) - \cos(2x)(3x^2 + 1)$$

$$(x^3 + x)^2$$

12. Compute dy/dt if $e^y + t^3 = y \cos(y)$. You must solve for dy/dt. $e^y y' + 3t^2 = y' \cos(y) + y(-5my) \cdot y'$ $y' (e^y - \cos(y) + y\sin(y)) = -3t^2$

$$\frac{dy}{dt} = \frac{-3t^2}{e^y - \cos(y) + y \sin(y)}$$