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

$$\int (x) = \frac{1}{5} - \frac{1}{3} \times \frac{-2\sqrt{3}}{3}$$

2. 
$$h(x) = e^{-x/3}\cos(x)$$

$$(x) = -\frac{1}{3}e^{-x/3}\cos(x) + e^{-x/3}(-\sin(x))$$

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

$$\int \int (t) dt = -t^{-2} + 2t^{-\frac{3}{2}} + 2t$$

$$4. g(x) = \frac{1}{\sin(x)} = \csc(x)$$

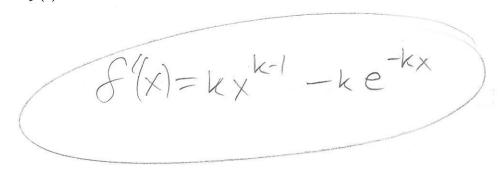
$$(x) = -\csc(x) \cot(x)$$

5. 
$$y = \arccos\left(2x^{1/4} + \sqrt{6}\right)$$

$$y = -1 - \left(\frac{1}{2} \times \frac{-3}{4}\right)$$

$$y = -1 - \left(\frac{1}{2} \times \frac{-3}{4}\right)$$

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



## Math 251: Derivative Proficiency

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

$$\frac{dy}{dx} = \frac{\sec^2(x)(1+h(x)) - \tan(x)(\frac{1}{x})}{(1+h(x))^2}$$

8. 
$$y = e^x \ln(2x) \sec(x)$$

$$y' = e^{x} h(2x) \cdot sec(x)$$

$$+ e^{x} \cdot \frac{1}{2x} \cdot 2 \cdot sec(x)$$

$$+ e^{x} \cdot \ln(2x) \cdot sec(x) tam(x)$$

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

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

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10. 
$$h(x) = \frac{\pi}{x^2} + \left(\frac{x-1}{4}\right)^3$$

$$h'(x) = -2\pi x^{-3} + 3(x-1)^{2}(4)$$

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

$$g'(x) = \frac{-\sin(2x) \cdot 2(x^3 + x) - \cos(2x)(3x^2 + 1)}{(x^3 + x)^2}$$

12. Compute dy/dt if  $ye^y + 5 = 2\sin(y)t^3$ . You must solve for dy/dt.

$$y'e^{y} + ye^{y} = 2\cos(y)yt^{3} + 2\sin(y)3t^{2}$$
  
 $y'(e^{y} + ye^{y} - 2t^{3}\cos(y)) = 6t^{2}\sin(y)$ 

$$\frac{dy}{dt} = \frac{6t^2 s \dot{m}(y)}{e^{y}(1+y) - 2t^3 cos(y)}$$