

Compute the derivative of each of the functions and simplify your answer. Calculator use is **NOT** allowed on this test, and no partial credit will be awarded.

1. $f(x) = e^{x^2}$ $f'(x) = e^{x^2} \cdot 2x = 2xe^{x^2}$

2. $f(x) = xe^{3x}$ $f'(x) = x \cdot e^{3x} \cdot 3 + e^{3x} = e^{3x}(3x+1)$

3. $f(x) = \ln(x^2 + 1)$ $f'(x) = \frac{1}{x^2+1} \cdot 2x = \frac{2x}{x^2+1}$

4. $f(x) = \frac{\tan^{-1}(2x)}{x}$ $f'(x) = \frac{x \cdot \frac{2}{1+(2x)^2} - \tan^{-1}(2x)}{x^2} = \frac{2x - (\tan^{-1}(2x))(1+4x^2)}{x^2(1+4x^2)}$

5. $f(x) = (\sin x) \ln x$ $f'(x) = \frac{\sin x}{x} + \ln x \cdot \cos x$

6. $f(x) = x \sin^{-1} x$ $f'(x) = \frac{x}{\sqrt{1-x^2}} + \sin^{-1} x$

7. $f(x) = \frac{x}{\ln x}$ $f'(x) = \frac{\ln x - x/x}{(\ln x)^2} = \frac{\ln x - 1}{(\ln x)^2}$

8. $f(x) = \sin^{-1} x^2$ $f'(x) = \frac{1}{\sqrt{1-(x^2)^2}} \cdot 2x = \frac{2x}{\sqrt{1-x^4}}$

9. $f(x) = \tan^{-1} 3x$ $f'(x) = \frac{1}{1+(3x)^2} \cdot 3 = \frac{3}{1+9x^2}$

10. $f(x) = 7e^x - 3 \ln x$ $f'(x) = 7e^x - \frac{3}{x}$