

Math 131 - Quiz 9

October 30, 2025

Name key

Score _____

Show all work to receive credit. Supply explanations where necessary.

1. (3 points) Let $F(x) = \ln\left(\frac{x^4 e^{2x}}{(2x+5)^3}\right)$. Use the logarithm laws to expand $F(x)$. Then determine $F'(x)$.

$$F(x) = 4 \ln x + 2x \ln e - 3 \ln(2x+5)$$

$$F(x) = 4 \ln x + 2x - 3 \ln(2x+5)$$

$$F'(x) = \frac{4}{x} + 2 - \frac{6}{2x+5}$$

2. (4 points) Determine each derivative.

(a) $\frac{d}{dx} e^{4x} \sin(2x) = 4e^{4x} \sin(2x) + e^{4x} 2 \cos(2x)$

$$= 4e^{4x} \sin(2x) + 2e^{4x} \cos(2x)$$

(b) $\frac{d}{dx} \ln(x + \sqrt{x}) = \frac{1}{x + \sqrt{x}} \left(1 + \frac{1}{2} x^{-1/2}\right) =$

$$\frac{1 + \frac{1}{2} x^{-1/2}}{x + \sqrt{x}}$$

3. (3 points) Use logarithmic differentiation to find dy/dx when $y = x^{\sin x}$.

$$\ln y = (\sin x)(\ln x)$$

$$\frac{1}{y} \frac{dy}{dx} = (\cos x)(\ln x) + \frac{\sin x}{x}$$

$$\frac{dy}{dx} = \left[(\cos x)(\ln x) + \frac{\sin x}{x} \right] (x^{\sin x})$$