

# Math 131 - Quiz 8

October 25, 2023

Name key

Score \_\_\_\_\_

Show all work to receive full credit. Supply explanations when necessary.

1. (5 points) Determine the derivative of each function.

(a)  $y = xe^{x^2}$

$$\frac{dy}{dx} = e^{x^2} + x e^{x^2} \cdot 2x = e^{x^2} + 2x^2 e^{x^2}$$

(b)  $f(x) = \ln(x^3 \sin^2 x)$

$$f(x) = 3 \ln x + 2 \ln \sin x$$

$$f'(x) = \frac{3}{x} + \frac{2 \cos x}{\sin x}$$

2. (2 points) Find the exact value of each.

(a)  $\arcsin(1/2) = \pi/6$  BECAUSE  $\sin(\pi/6) = 1/2$  AND  $\pi/6$  IS BETWEEN  $-\pi/2$  &  $\pi/2$

(b)  $\log_3(3^9) = 9 \log_3 3 = 9$

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

$$\ln y = \ln x^{\sqrt{x}}$$

$$\ln y = \sqrt{x} \ln x$$

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

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

$$\frac{1}{y} \frac{dy}{dx} = \frac{\ln x}{2\sqrt{x}} + \frac{1}{\sqrt{x}}$$