

Math16600 Section 23715 Quiz 2

Fall 2023, September 05

Name:

[1 pt]

Problem 1: Use logarithmic differentiation to find the derivative of the function

$$f(x) = x^{\sin x}$$

$$y = x^{\sin x} \Rightarrow \ln y = \sin x \ln x$$

[5 pts]

Differentiating both sides:

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

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

Problem 2: Evaluate the integral:

$$\int \frac{(\ln x)^2}{x} dx$$

$$\text{let } u = \ln x \Rightarrow \frac{du}{dx} = \frac{1}{x} \Rightarrow du = \frac{dx}{x}$$

[5 pts]

$$I = \int (\ln x)^2 \frac{dx}{x} = \int u^2 du = \frac{u^3}{3} + C$$

$$= \frac{(\ln x)^3}{3} + C$$