

BONUS (3 marks)

Find the derivative.

$y = x^{x^x}$ (Hint: Use logarithmic differentiation twice)

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

$$\ln y = x^x \ln x$$

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

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

$$\frac{1}{\ln y} \frac{1}{y} y' = \ln x + \frac{x}{x} + \frac{1}{\ln x} \frac{1}{x}$$

$$y' = y \ln y \left(\ln x + 1 + \frac{1}{x \ln x} \right)$$

$$y' = x^{x^x} \ln(x^{x^x}) \left(\ln x + 1 + \frac{1}{x \ln x} \right)$$