

$$y = \ln x$$

$$\frac{dy}{dx} = \frac{1}{x} \cdot dx$$

$$y = a^x$$

$$\frac{dy}{dx} = \ln a \cdot a^x \cdot dx$$

$$y = e^x$$

$$y' = \ln e \cdot e^x \quad \star$$

$\star a = \text{CONSTANT}$

EXERCISE 56

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1-2

① a.) $y = 5^{3x}$

$$\frac{dy}{dx} = \ln 5 \cdot 5^{3x} \cdot 3$$

$$\frac{dy}{dx} = 3 \ln 5 \cdot 5^{3x}$$

b.) $y = \ln(4x+1)$

$$\frac{dy}{dx} = \frac{1}{4x+1} \cdot 4$$

$$\frac{dy}{dx} = \frac{4}{4x+1}$$

② a.) $y = 1 + 2 \ln x$

$$\frac{dy}{dx} = 2 \cdot \frac{1}{x}$$

$$= \frac{2}{x}$$

b.) $y = \frac{1}{\ln x}$

$$y = (\ln x)^{-1}$$

$$\frac{dy}{dx} = -(\ln x)^{-2} \cdot \frac{1}{x}$$

$$\frac{dy}{dx} = \frac{-1}{x(\ln x)^2}$$

EX: 32

$$y = x^x \quad \leftarrow \text{BASE NOT A CONSTANT!!}$$

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

$$\ln y = x \cdot \ln x$$

$$\frac{1}{y} \cdot \frac{dy}{dx} = (1)(\ln x) + (x)\left(\frac{1}{x}\right) \quad \text{PRODUCT RULE}$$

$$\frac{dy}{dx} = y(\ln x + 1) \quad \text{SOLVE + SUBSTITUTE}$$

$$\frac{dy}{dx} = x^x(\ln x + 1) \quad \text{TRICKY!!}$$

EX: 33

$$y = e^{e^x}$$

a.) $\frac{dy}{dx} = e^{e^x} \cdot e^x$

$$\frac{dy}{dx} = e^{e^x+1} = 0$$

$$e^{e^x+1} \neq 0$$

2.7[?] to

∴ NO ANSWER

b.) $\frac{dy}{dx} = e^x e^{e^x}$ at $x=0$

$$= e^0 e^{e^0}$$

$$= 1 \cdot e^1$$

(0, e)

$$e = e(0) + b$$

$$b = e$$

SCOPE = e

$$y = e^x + e$$

c.)