

Calculus - Derivatives of Exponential Functions

Key

Find the derivative of each function.

$$\textcircled{1} f(x) = e^{2x^2}$$

$$f'(x) = (6x^2)(e^{2x^2})$$

$$\textcircled{2} y = e^{(4x^3+5)^2}$$

$$\frac{dy}{dx} = 2(4x^3+5)(12x^2)(e^{(4x^3+5)^2})$$

$$= (24x^2)(4x^3+5)(e^{(4x^3+5)^2})$$

$$\textcircled{3} y = e^{(e^{3x})}$$

$$\frac{dy}{dx} = 3e^{3x}(e^{e^{3x}})$$

$$\textcircled{4} y = \frac{e^{5x^4}}{e^{4x^2+3}}$$

$$a' = 20x^3 e^{5x^4}$$

$$b' = 8x e^{4x^2+3}$$

$$\frac{dy}{dx} = \frac{(20x^3/e^{5x^4})(e^{4x^2+3}) - (e^{5x^4})(8x)(e^{4x^2+3})}{(e^{4x^2+3})^2}$$

$$= \frac{4x(e^{5x^4}/e^{4x^2+3})[5x^2 - 2]}{(e^{4x^2+3})^2}$$

Answer on back of sheet

$$\textcircled{5} y = 4^{5x^3}$$

$$\frac{dy}{dx} = (\ln 4)(15x^2)(4^{5x^3})$$

$$\textcircled{6} f(x) = (4^{x^3} + 2)^3$$

$$f'(x) = 3(4^{x^3} + 2)^2 (\ln 4)(3x^2)(4^{x^3})$$

$$\textcircled{7} y = 3^{(x^4+1)^3}$$

$$\frac{dy}{dx} = (\ln 3)(3(x^4+1)^2(4x^3))(3^{(x^4+1)^3})$$

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$$\frac{dy}{dx} = \frac{4x(e^{5x^4})(5x^3-2)}{e^{4x^2+3}}$$