

AP Calculus BC

Derivatives of Exp & Logs

$$\begin{aligned} 1) \quad y &= x^2 \ln x \\ y' &= x^2 \cdot \frac{1}{x} + 2x \ln x \\ y' &= x + 2x \ln x \end{aligned}$$

$$\begin{aligned} 2) \quad y &= \sin(2x) + 2^{\sin x} \\ y' &= 2\cos(2x) + 2^{\sin x} \cos x (\ln 2) \end{aligned}$$

$$\begin{aligned} 3) \quad y &= e^{2x} \\ y' &= 2e^{2x} \end{aligned}$$

$$\begin{aligned} 4) \quad g(x) &= \log_9 (6x^4 + 3)^5 \\ g'(x) &= \frac{5(6x^4 + 3)^4 \cdot 24x^3}{(\ln 9) \cdot (6x^4 + 3)^5} \\ &= \frac{120x^3}{(\ln 9)(6x^4 + 3)^5} \end{aligned}$$

$$\begin{aligned} 5) \quad y &= 5^{3x} \\ y' &= 5^{3x} \cdot 3 \cdot \ln 5 \end{aligned}$$

$$\begin{aligned} 6) \quad f(x) &= 5^{x^3 - 7} \\ f'(x) &= 5^{x^3 - 7} \cdot 3x^2 (\ln 5) \end{aligned}$$

$$\begin{aligned} 7) \quad f(x) &= \ln(4x^3 + \sec x) \\ f'(x) &= \frac{12x^2 + \sec x \tan x}{4x^3 + \sec x} \end{aligned}$$

$$\begin{aligned} 8) \quad y &= \sin(\ln x) \\ y' &= \cos(\ln x) \cdot \frac{1}{x} \end{aligned}$$

$$\begin{aligned} 9) \quad y &= (x^2 + 1)^3 (4x + 3)^5 \\ y' &= (x^2 + 1)^3 \cdot 5(4x + 3)^4 \cdot 4 + (4x + 3)^5 \cdot 3(x^2 + 1)^2 \cdot 2x \end{aligned}$$

$$\begin{aligned} 10) \quad f(x) &= e^{\tan x} \\ f'(x) &= e^{\tan x} \cdot \sec^2 x \end{aligned}$$

$$\begin{aligned} 11) \quad y &= x^5 \cdot 3^{-3x} \\ y' &= x^5 [3^{-3x} \cdot (-3)(\ln 3)] + 5x^4 \cdot 3^{-3x} \end{aligned}$$

$$12) \quad g(x) = \sec(5^{2x}) + \ln \sqrt{4x+2}$$

$$g'(x) = \sec(5^{2x}) \tan(5^{2x}) \cdot 5^{2x} \cdot \ln 5 + \frac{\frac{1}{2}(4x+2)^{-1/2} \cdot 4}{(4x+2)^{1/2}}$$

$$= (\sec(5^{2x}) \tan(5^{2x})) \cdot 5^{2x} (\ln 5) + \frac{2}{(4x+2)}$$

$$= (\sec(5^{2x}) \tan(5^{2x})) \cdot 5^{2x} (\ln 5) + \frac{1}{2x+1}$$

$$13) \quad y = xe^{-x} \quad x=1$$

$$y' = x(-e^{-x}) + e^{-x}$$

$$y|_{x=1} = \frac{1}{e} \quad y'(1) = -\frac{1}{e} + \frac{1}{e} = 0$$

$$\boxed{y - \frac{1}{e} = o(x-1)}$$