AP Calculus BC

Derivatives of Exp & Logs

1) $y = x^2 \ln x$

$y' = x^2 \cdot \frac{1}{x} + 2x \ln x$

$y' = x + 2x \ln x$

2) $y = \sin(2x) + 2^{\sin x}$

$y' = 2\cos(2x) + 2^{\sin x} \cos x \, (\ln 2)$

3) $y = e^{2x}$

$y' = 2e^{2x}$

4) $g(x) = \log_9 (6x^4+3)^5$

$g'(x) = \frac{5(6x^4+3)^4 \cdot 24x^3}{(\ln 9) \cdot (6x^4+3)^5}$

$= \frac{120x^3}{(\ln 9)(6x^4+3)^5}$

5) $y = 5^{3x}$

$y' = 5^{3x} \cdot 3 \cdot \ln 5$

6) $f(x) = 5^{x^3-7}$

$f'(x) = 5^{x^3-7} \cdot 3x^2 (\ln 5)$

7) $f(x) = \ln(4x^3 + \sec x)$

$f'(x) = \frac{12x^2 + \sec x \tan x}{4x^3 + \sec x}$

8) $y = \sin(\ln x)$

$y' = \cos(\ln x) \cdot \frac{1}{x}$

9) $y = (x^2+1)^3 (4x+3)^5$

$y' = (x^2+1)^3 \cdot 5(4x+3)^4 \cdot 4 + (4x+3)^5 \cdot 3(x^2+1)^2 \cdot 2x$

10) $f(x) = e^{\tan x}$

$f'(x) = e^{\tan x} \cdot \sec^2 x$

11) $y = x^5 \cdot 3^{-3x}$

$y' = x^5 [3^{-3x} \cdot (-3)(\ln 3)] + 5x^4 \cdot 3^{-3x}$

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

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

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

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

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

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

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

$$\boxed{y - \frac{1}{e} = 0(x-1)}$$