

$$(1) y = \ln e^{-x^2}$$

$$y = -x^2 \ln e$$

$$y = -x^2 (1)$$

$$y' = -2x$$

$$(2) y = \ln \frac{e^x}{1-e^x}$$

$$y = \ln e^x - \ln(1-e^x)$$

$$y = x \ln e - \ln(1-e^x)$$

$$y = x(1) - \ln(1-e^x)$$

$$y' = 1 - \frac{-e^x}{1-e^x}$$

$$\text{or } y = \frac{(1-e^x)(e^x) - (-e^x)(e^x)}{(1-e^x)^2}$$

$$y = \frac{e^x}{1-e^x}$$

$$(3) y = e^{-\frac{x^2}{2}} = e^{-\frac{1}{2}x^2}$$

$$y' = (e^{-\frac{1}{2}x^2})' (-x)$$

$$(4) y = \sqrt[3]{e^{2x} - e^{-2x}}$$

$$y = (e^{2x} - e^{-2x})^{\frac{1}{3}}$$

$$y' = \frac{1}{3}(e^{2x} - e^{-2x})^{-\frac{2}{3}} (e^{2x}(2) - (e^{-2x})(-2))$$

$$y' = \frac{1}{3}(e^{2x} - e^{-2x})^{-\frac{2}{3}} (2e^{2x} + 2e^{-2x})$$

$$(5) y = \ln(\ln x^2) = \ln(2 \ln x)$$

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

$$(6) y = \ln \frac{x(x-1)}{x-2} = \ln \frac{x^2-x}{x-2}$$

$$y = \ln(x^2-x) - \ln(x-2)$$

$$y' = \left(\frac{2x-1}{x^2-x}\right) - \left(\frac{1}{x-2}\right)$$

$$\text{or } y = \ln x(x-1) - \ln(x-2)$$

$$y = \ln x + \ln(x-1) - \ln(x-2)$$

$$y' = \frac{1}{x} + \frac{1}{x-1} - \frac{1}{x-2}$$

$$\text{or } y' = \frac{(x-2)(x-1) + (x-2)(x-1) - (1)(x)(x-1)}{(x-2)^2}$$

$$y' = \frac{x(x-1)}{(x-2)^2}$$

$$(7) y = \ln^2 \sqrt{(e^x + x^2)^2}$$

$$y = \ln(e^x + x^2)^2$$

$$y = 2 \ln(e^x + x^2)$$

$$y' = \left(\frac{2}{3}\right) \left(\frac{e^x + 2x}{e^x + x^2}\right)$$

$$\text{or } y' = \frac{2(e^x + x^2)^{-\frac{2}{3}} (e^x + 2x)}{(e^x + x^2)^{\frac{2}{3}}}$$

$$(8) y = (\ln x^2)^2 = (2 \ln x)^2$$

$$y' = 2(2 \ln x) \left(\frac{2}{x}\right)$$

$$y' = \frac{8}{x} \ln x$$

$$(9) y = \frac{2+e^x}{3e^{4x}}$$

$$y' = \frac{(3e^{4x})[(e^x)(1)] - [(2+e^x)(4)](3e^{4x})}{(3e^{4x})^2}$$

$$y = (2+e^x) \left(\frac{1}{3}e^{-4x}\right)$$

$$y' = (2+e^x) \left(\frac{1}{3}e^{-4x}\right)(-4) + (e^x)(1) \left(\frac{1}{3}e^{-4x}\right)$$

$$\text{or } y = \frac{2}{3}e^{-4x} + \frac{1}{3}e^{-5x}$$

$$y' = \left(\frac{2}{3}e^{-4x}\right)(-4) + \left(\frac{1}{3}e^{-5x}\right)(-5)$$

$$(10) y = \log_3 5^{x^2+2x-1}$$

$$y = (x^2+2x-1)(\log_3 5)$$

$$y' = (\log_3 5)(2x+2)$$

$$\text{or } y' = \left(\frac{1}{\ln 3}\right) \left[\frac{(\ln 5)(5^{x^2+2x-1})(2x+2)}{5^{x^2+2x-1}}\right]$$

$$(11) y = 7e^{-x}$$

$$y' = (\ln 7)(7e^{-x}) \left[\frac{e^{-x}}{e^{-x}}\right](-1)$$

$$(12) y = \log_5 \sqrt{x^2-2x+1}$$

$$y = \log_5 (x^2-2x+1)^{\frac{1}{2}}$$

$$y = \frac{1}{2} \log_5 (x^2-2x+1)$$

$$y' = \left(\frac{1}{2}\right) \left(\frac{1}{\ln 5}\right) \left(\frac{2x-2}{x^2-2x+1}\right)$$

$$\text{or } y' = \left(\frac{1}{\ln 5}\right) \frac{\frac{1}{2}(2x-2)(2x+1)}{(x^2-2x+1)^2}$$

$$(13) y = \frac{1}{\log_4 e^{2x+1}}$$

$$y = \frac{1}{(2x+1)(\log_4 e)}$$

$$y = \left[\frac{1}{\log_4 e}\right] (2x+1)^{-1}$$

$$y' = \left(\frac{1}{\log_4 e}\right) (2x+1)^{-2}$$

$$y' = \left(\frac{1}{\log_4 e}\right) \left[-1(2x+1)^{-2}\right]$$

$$\text{or } y' = \frac{0 - (\log_4 e)(2)}{[\ln 4 (\log_4 e)]^2}$$

$$(14) y = e^{-x} \ln \sqrt{x}$$

$$y = (e^{-x}) \left(\frac{1}{2} \ln x \right)$$

$$y = \left(\frac{1}{2} e^{-x} \right) (\ln x)$$

$$y' = \left(\frac{1}{2} e^{-x} \right) \left(\frac{1}{x} \right) + \left(\frac{1}{2} e^{-x} \right) (-1) (\ln x)$$

$$\text{or } y = \frac{\ln x}{2e^x}$$

$$y' = \frac{(2e^x) \left(\frac{1}{x} \right) - (2e^x) (\ln x)}{(2e^x)^2}$$

$$(15) y = \ln \sqrt{\frac{2x-1}{3x+4}}$$

$$y = \ln \left(\frac{2x-1}{3x+4} \right)^{\frac{1}{2}} = \frac{1}{2} \ln \left(\frac{2x-1}{3x+4} \right)$$

$$y = \frac{1}{2} \ln(2x-1) - \frac{1}{2} \ln(3x+4)$$

$$y' = \left(\frac{1}{2} \right) \left(\frac{2}{2x-1} \right) - \left(\frac{1}{2} \right) \left(\frac{3}{3x+4} \right)$$

$$\text{or } y' = \frac{\left(\frac{1}{2} \right) \left(\frac{2x-1} {3x+4} \right)^{-\frac{1}{2}} \left[\frac{(3x+4)(2) - (2)(3x+4)}{(3x+4)^2} \right]}{\left(\frac{2x-1}{3x+4} \right)^{\frac{1}{2}}}$$

$$\text{or } y' = \left(\frac{1}{2} \right) \frac{(3x+4)(2) - (3)(2x-1)}{(3x+4)^2} \cdot \frac{3x+4}{2x-1}$$

$$(16) y = \ln \frac{e^x - e^{-x}}{x}$$

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

$$y' = \frac{e^x - (e^{-x})(-1)}{e^x - e^{-x}} - \frac{1}{x}$$

$$y' = \frac{e^x + e^{-x}}{e^x - e^{-x}} - \frac{1}{x}$$

$$\text{or } y' = \frac{(x) \left[\frac{e^x - (e^{-x})(-1)}{e^x - e^{-x}} \right] - (1)(e^x - e^{-x})}{x^2}$$

$$(17) y = 10^{\log(e^{x^2+2x-1})}$$

$$y = e^{x^2+2x-1}$$

$$y' = (e^{x^2+2x-1})(2x+2)$$

$$\text{or } y' = (\ln 10) \left(10^{\log(e^{x^2+2x-1})} \right) \left[\left(\frac{1}{\ln 10} \right) \frac{(e^{x^2+2x-1})(2x+2)}{e^{x^2+2x-1}} \right]$$

$$(18) y = \ln \frac{\sqrt{4-x^2}}{x+3} = \ln \frac{(4-x^2)^{\frac{1}{2}}}{x+3}$$

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

$$y' = \frac{1}{2} \left(\frac{-2x}{4-x^2} \right) - \frac{1}{x+3}$$

$$\text{or } y' = \frac{(x+3) \left[\frac{1}{2} (4-x^2)^{-\frac{1}{2}} (-2x) \right] - (1)(4-x^2)^{\frac{1}{2}}}{(x+3)^2} \cdot \frac{(4-x^2)^{\frac{1}{2}}}{x+3}$$

$$(19) y = \frac{\ln(5x^2+3x-4)}{e^{5-x}}$$

$$y' = \frac{(e^{5-x}) \left(\frac{10x+3}{5x^2+3x-4} \right) - (e^{5-x})(1) (\ln(5x^2+3x-4))}{(e^{5-x})^2}$$

$$\text{or } y = [\ln(5x^2+3x-4)] (e^{5-x})^{-1}$$

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

$$y' = [\ln(5x^2+3x-4)] [e^{x-5}(1)] + \left(\frac{10x+3}{5x^2+3x-4} \right) (e^{x-5})$$

$$(20) y = \sqrt[3]{e^{2x} x^3}$$

$$y = (e^{2x} x^3)^{\frac{1}{3}}$$

$$y' = \frac{1}{3} (e^{2x} x^3)^{-\frac{2}{3}} \left[(e^{2x})(3x^2) + (e^{2x})(2)(x^3) \right]$$

$$\text{or } y = e^{\frac{2}{3}x} x = x e^{\frac{2}{3}x}$$

$$y' = (x) (e^{\frac{2}{3}x}) \left(\frac{2}{3} \right) + (1) (e^{\frac{2}{3}x})$$