

① $y = 2 \cdot e^x$

$$\frac{dy}{dx} = 2 \cdot e^x$$

⑤ $y = e^{2x/3}$

$$\frac{dy}{dx} = \frac{2}{3} e^{2x/3}$$

⑨ $y = e^{\sqrt{x}}$

$$\frac{dy}{dx} = \frac{e^{\sqrt{x}}}{2\sqrt{x}}$$

⑬ $y = 3^{\csc x}$

$$\frac{dy}{dx} = -3^{\csc x} \cdot \ln 3 \cdot \csc x \cdot \cot x$$

⑰ $y = \ln\left(\frac{1}{x}\right)$

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

$$= -\frac{1}{x}, x > 0$$

⑳ $y = \log_4 x^2$

$$\frac{dy}{dx} = \frac{2x}{x^2 \cdot \ln 4} = \frac{2}{x \cdot \ln 4}$$

㉕ $y = \ln 2 \cdot \log_2 x$

$$\frac{dy}{dx} = \ln 2 \cdot \frac{1}{x \cdot \ln 2} = \frac{1}{x}, x > 0$$

㉙ $y = 3^x + 1, y' = 3^x \cdot \ln 3$

want $3^x \cdot \ln 3 = 5$

$$x = \log_3\left(\frac{5}{\ln 3}\right) = 1.379$$

$$y = 3^{1.379} + 1, 5.551$$

$$(1.379, 5.551)$$

㉓ $y = x^\pi, y' = \pi x^{\pi-1}$

㉗ $f(x) = \ln(x+2)$

$$f'(x) = \frac{1}{x+2}, x > -2$$

⇒

$$(41) f(x) = \log_2(3x+1)$$

$$f'(x) = \frac{3}{(3x+1) \cdot \ln 2}$$

$$3x+1 > 0$$

$$x > -\frac{1}{3}$$

$$(43) y = (\sin x)^x$$

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

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

$$\frac{1}{y} \frac{dy}{dx} = x \cdot \frac{1}{\sin x} \cdot \cos x + \ln \sin x$$

$$\frac{dy}{dx} = y (x \cdot \cot x + \ln \sin x)$$

$$\frac{dy}{dx} = (\sin x)^x (x \cdot \cot x + \ln \sin x)$$