

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

$$\frac{dy}{dx} = \frac{f'(x)}{f(x)}$$

$$f(x) = e^x$$

$$f'(x) = e^x dx$$

$$\frac{d}{dx}(a^x) = \ln a \cdot a^x$$

EXERC 5K

①

a. $y = \frac{3}{2}e^{x^2}$

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

$$\boxed{\frac{dy}{dx} = 3xe^{x^2}}$$

b. $y = -\frac{5}{e^{3x-1}}$

$$y = -5(e^{1-3x})$$

$$\frac{dy}{dx} = -5e^{1-3x} \cdot -3$$

$$\boxed{\frac{dy}{dx} = 15e^{1-3x}}$$

c. $y = e^{4x-1} + 4$

$$\frac{dy}{dx} = e^{4x-1} \cdot 4$$

$$\boxed{\frac{dy}{dx} = 4e^{4x-1}}$$

d. $y = e^x + \frac{1}{e^x}$

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

$$\frac{dy}{dx} = e^x + e^{-x} \cdot -1$$

$$\boxed{\frac{dy}{dx} = e^x - \frac{1}{e^x}}$$

e. $y = e^{-(1-3x)}$

$$y = e^{3x-1}$$

$$\frac{dy}{dx} = e^{3x-1} \cdot 3$$

$$\boxed{\frac{dy}{dx} = 3e^{3x-1}}$$

f. $y = 2e^{\sqrt{x}}$

$$\frac{dy}{dx} = 2e^{\sqrt{x}} \cdot \frac{1}{2}x^{-1/2}$$

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

②

a. $y = xe^x$

$$\frac{dy}{dx} = e^x + xe^x$$

$$\boxed{\frac{dy}{dx} = e^x(1+x)}$$

b. $y = \frac{x^2}{e^x}$

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

$$\frac{dy}{dx} = 2xe^{-x} + x^2 e^{-x}(-1) \quad \text{OR}$$

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

$$\boxed{\frac{dy}{dx} = \frac{x(2-x)}{e^x}}$$

$$\frac{dy}{dx} = \frac{e^x(2x) - x^2(e^x)}{(e^x)^2}$$

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

$$\boxed{\frac{dy}{dx} = \frac{x(2-x)}{e^x}}$$

c. $y = \frac{e^{2x}}{\sqrt{x}}$

$$\frac{dy}{dx} = \frac{\sqrt{x}e^{2x} \cdot 2 - e^{2x} \cdot \frac{1}{2}x^{-1/2}}{(\sqrt{x})^2}$$

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

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

$$\boxed{\frac{dy}{dx} = \frac{e^{2x}}{\sqrt{x}}(2 - \frac{1}{2x})}$$

d. $y = \sqrt{x}e^{\sqrt{x}}$

$$\frac{dy}{dx} = \frac{1}{2}x^{-1/2}e^{\sqrt{x}} + \sqrt{x} \cdot e^{\sqrt{x}} \cdot \frac{1}{2}x^{-1/2}$$
$$= \frac{1}{2}x^{-1/2}e^{\sqrt{x}}(1 + \sqrt{x})$$

$$\boxed{\frac{dy}{dx} = \frac{e^{\sqrt{x}}(1 + \sqrt{x})}{2\sqrt{x}}}$$