

1.(1) 解. 计算可得

$$y' = 4x + \frac{1}{x}, \quad y'' = 4 - \frac{1}{x^2}. \quad \blacksquare$$

1.(4) 解. 计算可得

$$\begin{aligned} y' &= -e^{-t} \sin t + e^{-t} \cos t = e^{-t}(\cos t - \sin t), \\ y'' &= -e^{-t}(\cos t - \sin t) + e^{-t}(-\sin t - \cos t) = -2e^{-t} \cos t. \end{aligned} \quad \blacksquare$$

1.(9) 解. 计算可得

$$\begin{aligned} y' &= 2x \arctan x + (1 + x^2) \cdot \frac{1}{1 + x^2} = 2x \arctan x + 1, \\ y'' &= 2 \arctan x + 2x \cdot \frac{1}{1 + x^2} = 2 \arctan x + \frac{2x}{1 + x^2}. \end{aligned} \quad \blacksquare$$

1.(10) 解. 计算可得

$$\begin{aligned} y' &= (e^x \cdot x^{-1})' = e^x x^{-1} - e^x x^{-2} = e^x(x^{-1} - x^{-2}), \\ y'' &= e^x(x^{-1} - x^{-2}) + e^x(-x^{-2} + 2x^{-3}) = e^x(x^{-1} - 2x^{-2} + 2x^{-3}). \end{aligned} \quad \blacksquare$$

3.(1) 解. 计算可得

$$\begin{aligned} \frac{dy}{dx} &= f'(x^2) \cdot 2x = 2xf'(x^2), \\ \frac{d^2y}{dx^2} &= 2f'(x^2) + 2xf''(x^2) \cdot 2x = 2f'(x^2) + 4x^2f''(x^2). \end{aligned} \quad \blacksquare$$