

$$1. f(x) = \ln 7x \quad y = \ln u \quad u = 7x \quad \frac{dy}{dx} = \frac{1}{u} = \frac{1}{7x} = \boxed{\frac{1}{x}}$$

$$\frac{dy}{du} = \frac{1}{u} \quad \frac{du}{dx} = 7$$

$$2. g(x) = \ln(3x^3) \quad g'(x) = \frac{\frac{d}{dx}(3x^3)}{3x^3} = \frac{9x^2}{3x^3} = \boxed{\frac{3}{x}}$$

$$3. h(x) = \ln(x^2 - 5x + 1) \quad h'(x) = \frac{\frac{d}{dx}(x^2 - 5x + 1)}{x^2 - 5x + 1} = \boxed{\frac{2x - 5}{x^2 - 5x + 1}}$$

$$4. f(x) = \ln(\sec x) \quad f'(x) = \frac{\frac{d}{dx} \sec x}{\sec x} = \frac{\sec x \tan x}{\sec x} = \boxed{\tan x}$$

$$5. f(x) = \ln(3 \sin(x^2)) \quad f'(x) = \frac{\frac{d}{dx}(3 \sin(x^2))}{3 \sin(x^2)} = \frac{\cos(x^2) \cdot 2x}{3 \sin(x^2)}$$

$$= \boxed{2x \cot(x^2)}$$

$$5. f(x) = \ln(\sin^2 x) \quad f'(x) = \frac{\frac{d}{dx}(\sin^2 x)}{\sin^2 x} = \frac{2 \sin x \cos x}{\sin^2 x}$$

$$= \frac{2 \cos x}{\sin x} = \boxed{2 \cot x}$$

$$7. g(x) = \log_2(x^5) \quad g'(x) = \frac{\frac{d}{dx}(x^5)}{(\ln 2) x^5} = \frac{5x^4}{x^5 \ln 2} = \boxed{\frac{5}{x \ln 2}}$$

$$8. \quad h(x) = \log_5 \cos x \quad h'(x) = \frac{\frac{d}{dx} \cos x}{(\cos x) \ln 5}$$

$$= \frac{-\sin x}{\cos x \ln 5} = \boxed{\frac{-\tan x}{\ln 5}}$$

$$9. \quad f(x) = \log(4x^3 + \cot x) \quad f'(x) = \frac{\frac{d}{dx}(4x^3 + \cot x)}{(\ln 10)(4x^3 + \cot x)}$$

$$= \boxed{\frac{12x^2 - \csc^2 x}{(\ln 10)(4x^3 + \cot x)}}$$

$$10. \quad f(x) = \ln(\ln x) \quad f'(x) = \frac{\frac{d}{dx}(\ln x)}{\ln x} = \frac{\frac{1}{x}}{\ln x}$$

$$= \boxed{\frac{1}{x \ln x}}$$