

$$5. f(x) = \ln \frac{e^{2x}-3}{e^x-5}$$

$$f(x) = \ln(e^{2x}-3) - \ln(e^x-5)$$

$$f'(x) = \frac{1}{e^{2x}-3} \cdot \frac{d}{dx}(e^{2x}-3) - \frac{1}{e^x-5} \cdot \frac{d}{dx}(e^x-5)$$

$$= \frac{1}{e^{2x}-3} \cdot e^{2x} \cdot \frac{d}{dx}(2x) - \frac{e^x}{e^x-5}$$

$$= \frac{2e^{2x}}{e^{2x}-3} - \frac{e^x}{e^x-5}$$

$$= \frac{2e^{2x}(e^x-5)}{(e^{2x}-3)(e^x-5)} - \frac{e^x(e^{2x}-3)}{(e^{2x}-3)(e^x-5)}$$

$$= \frac{2e^{3x} - 10e^{2x}}{(e^{2x}-3)(e^x-5)} - \frac{e^{3x} - 3e^x}{(e^{2x}-3)(e^x-5)}$$

$$= \frac{2e^{3x} - 10e^{2x} - e^{3x} + 3e^x}{(e^{2x}-3)(e^x-5)}$$

$$= \frac{e^{3x} - 10e^{2x} + 3e^x}{(e^{2x}-3)(e^x-5)}$$

$$= \frac{e^x(e^{2x} - 10e^x + 3)}{(e^{2x}-3)(e^x-5)}$$