6. $f(x) = \dfrac{\ln(3x-1)^2}{e^{4x}}$

$$f(x) = \frac{2\ln(3x-1)}{e^{4x}} \begin{array}{l})\,P \\ )\,Q \end{array} \quad \begin{array}{l} P' = \dfrac{1}{3x-1} \cdot \dfrac{d}{dx}(3x-1) = \dfrac{3}{3x-1} \\ Q' = e^{4x} \cdot \dfrac{d}{dx}(4x) = 4e^{4x} \end{array}$$

$$\frac{P'Q - PQ'}{Q^2}$$

$$f'(x) = 2\left[\frac{\frac{3}{3x-1} \cdot e^{4x} - \ln(3x-1) \cdot 4e^{4x}}{(e^{4x})^2}\right]$$

$$= 2\left[\frac{\cancel{e^{4x}}\left(\frac{3}{3x-1} - 4\ln(3x-1)\right)}{\cancel{e^{4x}} \cdot e^{4x}}\right]$$

$$= 2 \cdot \frac{\frac{3}{3x-1} - 4\ln(3x-1)}{e^{4x}}$$

$$= 2\left[\frac{\cancel{3x-1}\left(\frac{3}{\cancel{3x-1}}\right) - 4(3x-1)\ln(3x-1)}{e^{4x}(3x-1)}\right]$$

$$= \boxed{\frac{6 - 8(3x-1)\ln(3x-1)}{e^{4x}(3x-1)}}$$