

Q1).. Write down the formula for the derivative of a power function.

$$\frac{d}{dx}(x^a) = ax^{a-1} \quad (\text{where } a \text{ is any number}).$$

Write down the formula for the derivative of a quotient of two functions.

$$\frac{d}{dx}\left(\frac{f}{g}\right) = \frac{\frac{df}{dx} \cdot g - f \cdot \frac{dg}{dx}}{(g)^2}$$

Compute the derivative of the following.

$$f(x) = \frac{\sqrt{x} + \sqrt[3]{x}}{x^2 + 3x - 4}$$

Note that $\sqrt{x} = x^{\frac{1}{2}}$ and that $\sqrt[3]{x} = x^{\frac{1}{3}}$. Therefore we get

$$\begin{aligned} \frac{d(f)}{dx} &= \frac{\frac{d}{dx}(x^{\frac{1}{2}} + x^{\frac{1}{3}})(x^2 + 3x - 4) - (x^{\frac{1}{2}} + x^{\frac{1}{3}})\frac{d}{dx}(x^2 + 3x - 4)}{(x^2 + 3x - 4)^2} \\ &= \frac{\left(\frac{1}{2}x^{-\frac{1}{2}} + \frac{1}{3}x^{-\frac{2}{3}}\right)(x^2 + 3x - 4) - (x^{\frac{1}{2}} + x^{\frac{1}{3}})(2x + 3)}{(x^2 + 3x - 4)^2} \end{aligned}$$

All the differentiation is done at this point. There's no need to "simplify" any more...