Calculus I
Distributing before differentiating, part 2

Todor Milev

2019

Example (Difference Rule, Negative Fractional Exponents)

$$\text{Differentiate} \quad v = \frac{3\sqrt{x} - \sqrt[3]{x}}{x}.$$

$$v = 3\frac{\sqrt{x}}{x} - \frac{\sqrt[3]{x}}{x}$$

$$v = 3x^{-\frac{1}{2}} - x^{-\frac{2}{3}}.$$

$$\text{Difference Rule:} \quad \frac{\mathrm{d}v}{\mathrm{d}x} = \frac{\mathrm{d}}{\mathrm{d}x}\left(3x^{-\frac{1}{2}}\right) - \frac{\mathrm{d}}{\mathrm{d}x}\left(x^{-\frac{2}{3}}\right)$$

$$\text{Constant Multiple Rule:} \quad = 3\frac{\mathrm{d}}{\mathrm{d}x}\left(x^{-\frac{1}{2}}\right) - \frac{\mathrm{d}}{\mathrm{d}x}\left(x^{-\frac{2}{3}}\right)$$

$$\text{Power Rule:} \quad = 3\left(-\frac{1}{2}x^{-\frac{3}{2}}\right) - \left(-\frac{2}{3}x^{-\frac{5}{3}}\right)$$

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