

Differentiate the following with respect to  $x$

1)  $y = 6x^3$

2)  $f(x) = \frac{3}{x^2}$

3)  $\frac{5}{\sqrt{x^3}}$

4)  $y = \frac{5x-2}{\sqrt{x}}$

$$\frac{d}{dx}(ax^n) = anx^{n-1}$$

1)  $y = 6x^3$

$$\frac{dy}{dx} = 6 \cdot 3x^2$$

$$\frac{dy}{dx} = 18x^2$$

2)  $f(x) = \frac{3}{x^2}$

$$f(x) = 3x^{-2}$$

$$f'(x) = 3(-2)x^{-3}$$

$$f'(x) = \frac{-6}{x^3}$$

3)  $\frac{d}{dx}\left(\frac{5}{\sqrt{x^3}}\right)$

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

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

$$= -\frac{15}{2} \cdot \frac{1}{x^{\frac{5}{2}}}$$

$$= -\frac{15}{2\sqrt{x^5}}$$

4)  $y = \frac{5x-2}{\sqrt{x}}$

$$y = \frac{5x}{\sqrt{x}} - \frac{2}{\sqrt{x}}$$

$$y = 5x^{\frac{1}{2}} - 2x^{-\frac{1}{2}}$$

$$\frac{dy}{dx} = 5\left(\frac{1}{2}\right)x^{-\frac{1}{2}} - 2\left(-\frac{1}{2}\right)x^{-\frac{3}{2}}$$

$$\frac{dy}{dx} = \frac{5}{2x^{\frac{1}{2}}} + \frac{1}{x^{\frac{3}{2}}}$$

$$\frac{dy}{dx} = \frac{5}{2\sqrt{x}} + \frac{1}{\sqrt{x^3}}$$